

Globalisation, Ethnicity and Cultural Practices: A Case Study of Karimganj District of Assam



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Abstract

Globalisation is such a term that we are familiar with. This globalization has touched every corner of the society whether it is economic, political, and social and made wide changes in every aspect. Sometimes having positive impact and sometimes the negative one. Globalisation also has brought the outer world to the home which got its impact even in the cultural and value system of the ethnic groups. If we look around we can find so many remix of cultural practices are going on throughout different groups of the people of the society which slowly removing the original cultural practices. The present paper attempts to find out the impact of globalization on the cultural practices of the ethnic people of Karimganj district of Assam. In Karimganj District there are some groups of people who have unique cultural practices in different social events- like marriage ceremony, first rice eating celebration of child, different practices of worshiping God in plants, trees, reptiles etc as well as festivals. With the flow of Globalisation these cultural practices are done in blended mode. Multistage purposive random sampling technique has been used to collect the necessary information. The impact of globalization is seen by the practices of the people on the basis of their awareness level and how far they are interested in practicing. It is found that since with the flow of globalization in the town area through social media education, communication and availability of services younger generation on the town area of Karimganj district as well as of the rural areas are getting less interested in their own cultural foods, clothing and ritual practices. The flow of globalization is found to slowly entering even in the lifestyle of the older generations too.

Keywords: Culture, Ethnicity, Globalisation.

Introduction

Globalization is such a term that we are familiar with. The term globalization is defined in different ways by different people as it is a complex and multifaceted phenomenon. According to the Oxford English Dictionary the word 'globalization' first comes into existence in 1930s with the publication of the book named 'Toward New Education'. Initially it referred as the economic transactions & growth of economy and gradually has touched every corner of the society whether it is economic, political, and social and made wide changes in every aspect. The term globalization itself has large number of definitions. It is difficult to say what exactly constitute globalization as it is interpreted by different schools of thought on different matter at different point of time. Roland Robertson states that 'globalization as a concept refers both to the compression of the world and the intensification of consciousness of the world as a whole, both concreted global interdependence and consciousness of the globe whole'. The two sociologists Martin Albrow & Elizabeth King defines globalization as those processes by which the people of the world incorporate into a single world society. Alan L. Millman states very comprehensively three aspects of globalization:

1. Globalisation is the intensification of global flow of goods and production factors facilitated by modern transportation and communication.
2. Globalisation is a compression of time and space in a way that events in one part of the world effects on distant locations and
3. Globalisation is a historical structure of material power.

Thus, globalisation brings interchange of views, opinions and the various aspects of the culture everywhere around the world.

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Incorporation of nanosized $ZnWO_4$ and Fe_3O_4 on graphitic carbon nitride to fabricate a novel, highly active magnetically recoverable catalyst in Claisen–Schmidt condensation

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ABSTRACT

Herein we outline a facile and viable approach for successful anchoring of $ZnWO_4$ and Fe_3O_4 nanoparticles on graphitic carbon nitride ($g-C_3N_4$) through ultrasonication and microwave irradiation. The as-synthesised nanocomposite, $g-C_3N_4-Fe_3O_4-ZnWO_4$, was characterised using Fourier transform infrared spectroscopy, X-ray diffraction, scanning electron microscopy, energy-dispersive X-ray spectroscopy, transmission electron microscopy, vibrating-sample magnetometry, and X-ray photoelectron spectroscopy techniques. The nanocomposite exhibited appreciable catalytic performance in the Claisen–Schmidt condensation reaction between benzaldehyde and acetone producing dibenzalacetone with excellent yields. The as-prepared catalyst demonstrated excellent magnetically recyclable property for seven successive runs. The presence of $g-C_3N_4$ in the nanocomposite $g-C_3N_4-Fe_3O_4-ZnWO_4$ played a significant role in promoting the catalytic activity due to its inherent basic nature and efficient grafting of the substrates onto the $g-C_3N_4$ sheets.

1. Introduction

Development of existing catalytic technologies for synthesis of important organic compounds is viewed as a significant goal in scientific research. Such advances have been at the cutting edge of research for several generations [1–3]. The base-catalysed organic transformations such as Knoevenagel, aldol, Claisen–Schmidt condensations, and transesterification reactions are of great significance in both industry and academic research [4]. The Claisen–Schmidt or crossed aldol condensation is an efficient process for making carbon–carbon bonds in the formation of various sorts of carbonyl compounds [5–8]. Such a reaction between acetone and benzaldehyde leads to formation of dibenzalacetone (DBA), which is synthetically quite useful owing to its property of absorbing harmful UV radiation from the sun, which is used to protect human skin. It is thus an essential ingredient of sunscreens [9]. The DBA and some of its derivatives also exhibit anti-inflammatory [10], anti-parasitic [11], and anti-mycobacterial [12] properties; DBA is also used as a ligand in organometallic chemistry [13]. Such reactions often need stoichiometric amounts of the base together with increased reaction time, lack of reusability, and harsh reaction conditions such as high temperature. Presence of bases in the final reaction mix are often difficult to isolate, resulting in tedious workup procedures like base

neutralisation steps, difficult product separation, and purification [4,5].

In recent times, organocatalysis has emerged as a promising approach for applications in green catalysis [4]. The organocatalyst graphitic carbon nitride ($g-C_3N_4$), an attractive and emerging two-dimensional material with large surface area, has attracted substantial attention due to its high nitrogen content and excellent chemical and heat stability [14–16]. The presence of nitrogen atoms in this material also results in its basic properties [17]. Moreover, $g-C_3N_4$ is cost effective and environmentally benign since it can be easily prepared by direct thermal condensation of nitrogen-rich materials like urea, melamine, cyanamide, thiourea, and dicyanamide [16,14–21]. The basic sites inherent in $g-C_3N_4$ are due to the presence of some uncondensed primary and secondary amino groups lying at the edges of graphitic sheets obtained during pyrolysis of suitable carbon nitride precursors. This gives it a Lewis and Brønsted base character which can be exploited in base-catalysed organic reactions [17]. This surface basic nature of $g-C_3N_4$ makes it an efficient catalyst for several base-catalysed transformation reactions [21,22].

Recently, the immobilisation process has emerged as an efficient technique for improving catalytic activity [23]. The incorporation of metal and metal oxide nanoparticles on $g-C_3N_4$ nanosheets results in increased charge separations at the metal–semiconductor

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Study of core-shell $\alpha\text{-Fe}_2\text{O}_3\text{@Au}$ nanohybrid and their high catalytic performances in aerial oxidation of benzyl alcohols

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ABSTRACT

The current article highlights the facile synthesis and catalytic performance of $\alpha\text{-Fe}_2\text{O}_3\text{@Au}$ (core-shell) nanocomposite. Nanosized $\alpha\text{-Fe}_2\text{O}_3$ was synthesized by homogeneous precipitation of $\text{Fe}(\text{OH})_3$ followed by hydrothermal heating employing CTAB as the stabilizer. Modification of the nano $\alpha\text{-Fe}_2\text{O}_3$ with gold, resulted in the nanohybrid. Characterization studies of the nanocomposite $\alpha\text{-Fe}_2\text{O}_3\text{@Au}$ (core-shell) were accomplished using powder X-ray diffraction (XRD), Fourier transform Infrared spectroscopy, energy dispersive X-ray spectroscopy, transmission electron microscopy (TEM), and vibrating sample magnetometry. The synthesized composite $\alpha\text{-Fe}_2\text{O}_3\text{@Au}$ (core-shell) was explored for its catalytic action in the aerobic oxidation of benzyl alcohols. This nanohybrid showed magnificent catalytic performance up to five times reuses. The XRD and TEM investigations of the recycled catalyst reveal phenomenal resemblance to that of the fresh catalyst.

KEYWORDS

Aerobic oxidation;
 $\alpha\text{-Fe}_2\text{O}_3\text{@Au}$ (core-shell);
 Characterization;
 Magnetically Retrievable
 catalyst; Reusability;
 Recycled catalyst

1. Introduction

In recent years, energy has become an important concern leading to the need of catalysis as a new route to meet the challenges of energy and sustainability (Atalay and Ersoz, 2016). Nanocatalysis is a remarkable advancement in the domain of research which facilitates the study of nanostructured catalyst systems with increased stability and competence compared with the traditional catalysts. The catalysts are often very costly and thus their efficient recovery and reprocessing are highly encouraging. Recently, magnetic ultra-small materials have received praiseworthy attention as catalyst or catalyst support for the reason that they undergo easy and fast recovery and recyclability (Govan and Gun'ko, 2014; Rossi et al., 2014; Maleki, 2014a, 2014b, 2018a; Atalay and Ersoz, 2016; Kohantorabi and Gholami, 2017; Maleki et al., 2019a). Besides these, magnetic nanoparticles also have other advantages like easy preparation and functionalization, large surface area, low toxicity and low-priced (Maleki et al., 2018b, 2019b). Magnetic nanoparticles have efficiently performed as suitable catalysts

for several organic reactions such as nucleophilic substitution reaction of benzyl halides, oxidation of sulfides, oxidative coupling of thiols, Suzuki coupling reactions, esterification reaction, Knoevenagel reaction, C-C coupling reactions, epoxidation of alkenes, etc. (Abbasi et al., 2017; Ghorbani-Choghamarani et al., 2019). ZnFe_2O_4 has been used as catalyst in the synthesis of spirooxindole derivatives (Hasani and Irizeh, 2018) and 3-amino-5-methyl-[1,1'-biaryl]-2,4-dicarbonitriles (Mohammadi and Salmani, 2018), sulfonic acid supported on $\text{Fe}_2\text{O}_3/\text{VO}_2$ as nanocatalyst in spirooxindoles synthesis (Hassani et al., 2018), imidazole-functionalized magnetic Fe_3O_4 nanoparticles in one-pot Friedlander synthesis (Rezayati et al., 2016a, 2016b), FeTiO_3 as a magnetic catalyst for the solvent free synthesis of 2-amino-4*H*-chromene derivatives (Fardood et al., 2017) and so on.

Gold nanoparticles work as an active metal-based nanocatalyst framework in several organic transformation reactions due to its relativistic effect. Since Haruta's stupefying discovery on the catalytic potency of Au nanoclusters in the oxidation

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 Color versions of one or more of the figures in the article can be found online at www.tandfonline.com/gcec.

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Rural poverty and its dynamics in Barak Valley: An asset based approach**Ritumani Haloi**Ph. D Research Scholar,
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Assam, India-788011**Abstract:**

The concept, measurement and the issues related of rural poverty has undergone a distinctive change in recent years. Considering INR 828 for rural people and INR 1008 for the urban as poverty line at national level in 2011, about 21.9 percent are poor in India and this has found to be about 31.98 percent in the state of Assam as a whole. The main drawback of traditional measures of poverty (money metric or consumption expenditure) lies in the fact that it neglect of the underlying process of income generation which critically depends on the natural, physical, financial, social and human asset base of households. As a result the traditional measures failed to explain whether the observed poverty status of a household is a transitory phenomenon resulting from positive or negative stochastic events or is a persistent situation resulting from structural factors. In this context the asset based measures of poverty as suggested by Carter and May (2001) and asset indices by Johnston and Abreu (2013) facilitate a more reflective look into the nature and causes of poverty by allowing the decomposition of poverty into its stochastic and structural components. Against this backdrop, this paper utilizes data on income and assets obtained from a primary survey of 394 rural households in the Barak Valley region of Assam to understand the overall nature of deprivation and also to assess the asset ownership within the rural households. Regarding the methodology of the study, the households are first ranked in asset space for a wide variety of household assets on the basis of an asset index obtained from principal component analysis (PCA). The relation between household assets and realized income is then explored using OLS/FGLS method. The result shows that the deprivation in the Barak Valley region is stochastic and structural in nature and the capabilities to access the asset is very poor. So the short-term (safety net) and long-term (strengthening asset base) measure is important to tailor the poverty within the region effectively.

Keywords: Asset, Asset Poverty, Income Poverty, Structural Poverty, Stochastic Poverty.

Section-I: Introduction

Despite concerted efforts by government and other development agencies, poverty continues to plague millions around the world. It is difficult to have a consensus regarding the meaning of poverty which is acceptable globally everywhere. Broadly speaking, it be said that poverty is a situation where the individuals or population lack sufficient resources to attain minimum standard of well-being (usually in terms of consumption or income). However, it is argued that the income or



Research Article

Diversity of edible fungi (Oyster Mushrooms) and their importance

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Abstract

Mushrooms are valuable source of food used by human beings since ancient times. Edible and medicinal properties of wild mushrooms are known to many ancient civilizations. Some mushrooms have been reported as therapeutic foods, useful in preventing diseases such as hypertension, hypercholesterolemia, atherosclerosis and cancer. The genus *Pleurotus* belongs to the fungal family Pleurotaceae and order Agaricales. The present investigation reviews the biodiversity of oyster mushrooms, biological species concept, molecular and biochemical aspects, generalized nutritional value, volatile compounds etc.

Keywords: edible fungi; *Pleurotus*; protein; crude fibre; amino acid.

1. Introduction

Mushrooms have been used as nourishment throughout the world due to their rich nutrients such as proteins, carbohydrates, lipids, minerals (phosphorous and potassium), and vitamins [1]. Mushrooms are now-a-days considered as one of the most important functional food with many well-known therapeutic applications [2]. The genus *Pleurotus* (oyster mushroom) is an organoleptic fast growing fungus, which belongs to basidiomycota group. Although seventy species are discovered for this genus [3], only few of them are available in market such as *P. florida*, *P. sajor-caju* and *P. ostreatus* etc.

The biodiversity of *Pleurotus* is a major concern of numerous researchers [5]. Most of the research studies have been conducted with the aim of clarifying more about this genus and its identification in terms of morphological appearances. Recent molecular and biochemical techniques contribute a lot in this area. Needs for pure and well-identified strains in order to breed, preserve the gene variability and identify new species bring more emphasis on the importance of phylogenetic studies [6, 7].

2. Biodiversity of oyster mushroom

In the family of *Pleurotaceae*, species of the genus *Pleurotus* are the second most important commercial mushroom [8]. *Pleurotus* species can be grown in wide range of

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ANTIOXIDATIVE AND FREE RADICAL SCAVENGING POTENTIALS OF *CYCLOSORUS INTERRUPTUS* (WILLD.) H. ITÔ AND *PRONEPIRIUM NUDATUM* (ROXB. EX GRIFF.) HOLTUM

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ABSTRACT
Objectives: The work aims to screen the antioxidative potentials of different crude extracts of the fronds of two medicinally important pteridophytes of Southern Assam, India, namely, *Cyclosorus interruptus* (Willd.) H. Itô and *Proneprium nudatum* (Roxb. ex Griff.) Holtum.

Methods: Frond extracts of the pteridophytes were prepared by Soxhlet hot extraction method. Total phenolic content (TPC) and total flavonoid content (TFC) of the hexane, ethyl acetate, acetone, and methanol extracts of the fronds of the plants were done by following standard protocol. *In vitro* assessment of the antioxidative behavior of the extracts was performed using standard 2,2-diphenyl-1-picrylhydrazyl scavenging assay, reducing power assay, metal chelating assay, hydroxyl, superoxide, and 2,2'-azino-bis (3-ethylbenzothiazoline-6-sulfonic acid) radical scavenging methods in different *in vitro* systems.

Results: Preliminary phytochemical analysis implicated the presence of phenolic and flavonoid compounds in all the frond extracts. The methanol extract of the fronds of both the plants showed maximum phenolic and flavonoid contents in comparison to the other extracts, however, that of *C. interruptus* was found to be higher than *P. nudatum*. Antioxidative potentials of the said extracts were also found to be impressive and noteworthy. The decreasing order of the antioxidative efficacies of the extracts was found to be same as that of TPC and TFC of the extracts.

Conclusion: It is pertinent to comment that the methanol extract of the fronds of both the plants may be treated as a potential source of natural antioxidants.

Keywords: Pteridophytes, Phytochemical, Phenolic, Flavonoid, Antioxidant.

 © 2019 The Authors. Published by Innovare Academic Sciences Pvt Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>) DOI: <http://dx.doi.org/10.22159/ajpcr.2019.v12i9.32039>
INTRODUCTION

Prolonged persistence of free radicals followed by increasing oxidative stress in the human body triggers the advancement of many diseases including atherosclerosis, hypertension, diabetes mellitus, cancer, multiple sclerosis, liver diseases, kidney diseases, rheumatoid arthritis, aging, neurodegenerative, and cardiovascular disorders [1,2]. Antioxidant activity of plants is supposed to be due to their polyphenolic compounds especially the flavonoids [3], which are known to be potential free radical scavengers, hydrolytic as well as oxidative enzyme inhibitors and active against inflammations [4]. Many published research articles suggest that the bioactivities of these polyphenols correspond to their antioxidative nature [5-7].

 Many traditionally used medicinal plants have been validated to possess natural antioxidants [8-12]. Pteridophytes are nonflowering vascular cryptogams including a large group of ignored medicinal plants which are economically significant for their medicinal as well as nutraceutical values. Out of around 12,000 identified pteridophytes from the planet, 1000 species, 70 families, and 191 genera have been documented to exist in India [13,14] and 159 species from Southern Assam, i.e., Barak Valley region of Assam, India [15]. *Thelypteridaceae* is a family of about 900 pteridophyte species belonging to the order *Polypodiales* [16] of class *Polypodiopsida* [17]. Twenty-two species of pteridophytes belonging to *Thelypteridaceae* family have been reported from this region so far [15].

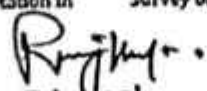
Cyclosorus interruptus is pantropically distributed and is commonly found in bogs, forested wetlands, uncultivated riverine land areas, and oozing woodland areas. It is also found on floating mats of vegetation in

 swamps or deep open marshes. Ethnopharmacological reports reflect the traditional use of *C. interruptus* as a remedial source to cure boils, sores, cough, liver diseases, gonorrhoea, and malaria [15,18-20]. The boiled fronds of the plant are also used to treat gastric ulcer [18,19], which is apart from being caused by the bacterium, *Helicobacter pylori* [21] is also assumed to be triggered and aggravated by oxidative stress [22].

Proneprium nudatum (Roxb. ex Griff.) Holtum of *Thelypteridaceae* family is a bulky land-dwelling pteridophyte, forming extensive gatherings in the moist forest as vegetation, commonly near rivers. It also grows in damp places in the plain land. The fronds of *P. nudatum* are used to treat pyorrhoea and other disorders of teeth gums. A local ethnobotanical report [23] suggests the use of a cold decoction of pinnae of the plant as a mouthwash for 2-3 times/day during acute pyorrhoea [15,24,25]. Although the two plants have considerable ethnomedicinal importance, still negligible attempts have been taken to validate their medicinal potentialities. In this article, the *in vitro* antioxidant as well as free radical scavenging activities of *C. interruptus* and *P. nudatum* frond extracts in various *in vitro* models have been reported.

MATERIALS AND METHODS
Collection of plant material

 Fresh fronds of *C. interruptus* (voucher specimen no. 17602) and *P. nudatum* (voucher specimen no. 46591) were collected from their natural habitats at Durgakona village of Cachar district and Kamalpur village of Karimganj district of Southern Assam, India respectively. The herbarium sheets of both the collected specimens have been submitted to the Assam University Herbarium and identified from Botanical Survey of India, Shillong.


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Assets, Rural Livelihood Strategies and Welfare Outcomes: A Case Study from South Assam, India

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Abstract

This article uses income and asset data from a sample of 394 rural households from the remote and agriculturally backward region of the Barak Valley, located in the southern part of the north-eastern state of Assam in India, to construct a poverty profile for the area based on the asset structure of households. In doing so, the study goes beyond the traditional income-centric approach which treats the poor as a homogeneous group and takes a deeper look into the character of poverty in the region by segregating households on the basis of various poverty configurations. Further, using a combination of cluster analysis and propensity score matching methods, the study explores the relation between asset ownership and the choice of livelihood strategies and subsequently evaluates the impact of such choices on the income poverty status of rural households. The study finds that vulnerability is very high in the study area, with two-thirds of the rural households being afflicted with one type of deprivation or the other. However, the nature of deprivation being diverse, the study underscores the need for profiling poverty in terms of its structural and stochastic components and designing policy interventions suited to specific situations, for maximisation of welfare gains.

Keywords Structural Poverty · Stochastic Poverty · Assets · Rural livelihood

1 Introduction

An asset-based approach to poverty analysis is relatively nascent in the development literature and grew out of the dissatisfaction with the income-/expenditure-centric approach to poverty measurement. The chief opposition to the income/expenditure approach as embodied in the Foster–Greer–Thorbecke (1984) measures is that

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Cyathea gigantea (Cyatheaceae) as an antimicrobial agent against multidrug resistant organisms

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Abstract

Background: Rapid emergence of multidrug resistant (MDR) organisms in hospital and community settings often result into treatment failure, thus leading the clinicians with fewer treatment options. *Cyathea gigantea*, an ethnomedicinally important fern used in cuts and wound infections. So, if this medicinal plant is used in treating the MDR infections then it might bring certain relief in future treatment options.

Methods: Antibacterial activity of *C. gigantea* against MDR bacteria was assed using well diffusion and broth microdilution methods to determine the diameters of growth inhibition zones, minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC). Synergistic activity was also determined with the conventional antibiotics by disc diffusion method followed by FIC index of each of the tested antibiotic was calculated. The active extract was then subjected to fractionation by column chromatography and antibacterial activity was done with each of the collected fractions.

Results: Crude extract of *C. gigantea* was found to be active against all the tested organisms. The MIC was 200 µg/ml against Gram-positive i.e., *Staphylococcus aureus* ATCC 25923 and 400 µg/ml against Gram-negative i.e., *Escherichia coli* ATCC 25922 and *Pseudomonas aeruginosa* PAO1, while the MBC was 400 µg/ml in case of Gram-positive and 800 µg/ml for Gram-negative. The synergistic activity revealed that the plant extract increased the antibacterial property of the studied antibiotics and the FIC index showed that significant synergistic activity was shown by ciprofloxacin followed by tetracycline, ampicillin and oxacillin. Antibacterial activity with the fractionated extract showed that the FR II, FR III and FR IV were active against both Gram-positive and Gram-negative bacteria, whereas FR I, FR V and FR VI did not show antibacterial property against any of the tested bacteria.

Conclusions: Extracts of *C. gigantea* was found active against both selected Gram-positive and Gram-negative organisms and thus offers the scientific basis for the traditional use of the fern. The present study also provides the basis for future study to validate the possible use against multidrug resistant organisms.

Keywords: *Cyathea gigantea*, Cyatheaceae, Extracts, Antibiotics, MDR bacteria, Antibacterial, Synergy

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RESEARCH ARTICLE

Open Access

Contrasting diversity of vaginal lactobacilli among the females of Northeast India



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Abstract

Background: Lactobacilli are gatekeepers of vaginal ecosystem impeding growth of pathogenic microbes and their diversity varies across populations worldwide. The present study investigated diversity of human vaginal microbiota among females of Northeast India, who are distinct in dietary habits, lifestyle, and genomic composition from rest of India.

Results: Altogether, 154 bacterial isolates were obtained from vaginal swab samples of 40 pregnant and 29 non-pregnant females. The samples were sequenced for 16S rRNA gene and analysed for identification using a dual approach of homology search and maximum likelihood based clustering. Molecular identification based on 16S rRNA gene sequence confirmed the isolates belonging to 31 species. Lactobacilli constituted 37.7% of the bacterial isolates with 10 species and other Lactic Acid Bacteria (39.61%) represented another 10 species, some of which are opportunistic pathogens. The remaining of the communities are mostly dominated by species of *Staphylococcus* (14.28%) and rarely by *Propionibacterium avidum* (3.90%), *Bacillus subtilis*, *Escherchia coli*, *Janthinobacterium lividum*, and *Kocuria kristinae* (each 0.64%). Interestingly *Lactobacillus mucosae* and *Enterococcus faecalis*, which are globally uncommon vaginal microbes is found dominant among women of Northeast India. This tentatively reflects adaptability of particular *Lactobacillus* species, in distinct population, to better compete for receptors and nutrients in vaginal epithelium than other species. Further, intragenetic 16S rRNA gene exchange was observed among *Enterococcus*, *Staphylococcus*, and two species of *Lactobacillus*, and deep intraspecies divergence among *L. mucosae*, which pinpointed possibility of emergence of new strains with evolved functionality. Lactobacilli percentage decreased from young pregnant to aged non-pregnant women with maximum colonization in trimester II.

Conclusion: The study highlighted importance of assessment of vaginal microbiota, *Lactobacillus* in particular, across different population to gain more insight on female health.

Keywords: Vaginal microbiota, *Lactobacillus*, Northeast India, Non-pregnant and pregnant women

Background

Lactobacilli are the predominant microbes in the vaginal microenvironment of healthy females [1]. A key feature that favours colonization of *Lactobacillus* is low vaginal pH due to metabolism of glycogen to lactic acid; glycogen deposits in vaginal epithelial cells in response to rise in circulating estrogen [2, 3]. The predominance of *Lactobacillus* promotes vaginal health by inhibiting

colonization of pathogenic microbes at acidic pH and also by producing antimicrobial bacteriocins [4]. However, the vaginal pH and *Lactobacillus* levels vary over the life course of women [5]. During bacterial vaginosis (BV), *Lactobacillus* predominance is lost and replaced by pathogenic microbes, which adversely affects women health making susceptible to HIV, HSV-2, pathogenic microorganisms such as *Neisseria gonorrhoeae*, *Gardnerella vaginalis*, *Escherchia coli*, *Staphylococcus aureus*, *Peptostreptococcus anaerobius*, *P. bivia*, and *Chlamydia trachomatis*, pelvic inflammatory disease and pre-term delivery [6–13]. Therefore, Lactobacilli are considered gatekeepers of vaginal ecosystem and understanding

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RESEARCH ARTICLE

Open Access

Cyathea gigantea (Cyatheaceae) as an antimicrobial agent against multidrug resistant organisms



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Abstract

Background: Rapid emergence of multidrug resistant (MDR) organisms in hospital and community settings often result into treatment failure, thus leading the clinicians with fewer treatment options. *Cyathea gigantea*, an ethnomedically important fern used in cuts and wound infections. So, if this medicinal plant is used in treating the MDR infections then it might bring certain relief in future treatment options.

Methods: Antibacterial activity of *C. gigantea* against MDR bacteria was assed using well diffusion and broth microdilution methods to determine the diameters of growth inhibition zones, minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC). Synergistic activity was also determined with the conventional antibiotics by disc diffusion method followed by FIC Index of each of the tested antibiotic was calculated. The active extract was then subjected to fractionation by column chromatography and antibacterial activity was done with each of the collected fractions.

Results: Crude extract of *C. gigantea* was found to be active against all the tested organisms. The MIC was 200 µg/ml against Gram-positive i.e. *Staphylococcus aureus* ATCC 25923 and 400 µg/ml against Gram-negative i.e. *Escherichia coli* ATCC 25922 and *Pseudomonas aeruginosa* PAO1, while the MBC was 400 µg/ml in case of Gram-positive and 800 µg/ml for Gram-negative. The synergistic activity revealed that the plant extract increased the antibacterial property of the studied antibiotics and the FIC index showed that significant synergistic activity was shown by ciprofloxacin followed by tetracycline, ampicillin and oxacillin. Antibacterial activity with the fractionated extract showed that the FR II, FR III and FR IV were active against both Gram-positive and Gram-negative bacteria, whereas FR I, FR V and FR VI did not show antibacterial property against any of the tested bacteria.

Conclusions: Extracts of *C. gigantea* was found active against both selected Gram-positive and Gram-negative organisms and thus offers the scientific basis for the traditional use of the fern. The present study also provides the basis for future study to validate the possible use against multidrug resistant organisms.

Keywords: *Cyathea gigantea*, Cyatheaceae, Extracts, Antibiotics, MDR bacteria, Antibacterial, Synergy

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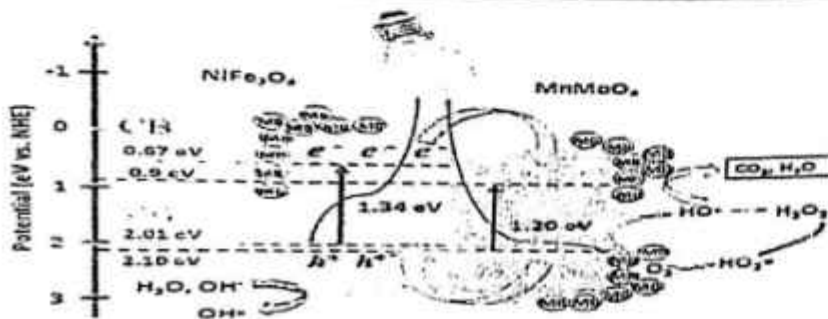
Construction of hierarchical MnMoO₄/NiFe₂O₄ nanocomposite: Highly efficient visible light driven photocatalyst in the degradation of different polluting dyes in aqueous medium

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GRAPHICAL ABSTRACT



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ABSTRACT

Herein we report a facile and cost-effective design for the fabrication of a new binary MnMoO₄/NiFe₂O₄ nanocomposite through co-precipitation and hydrothermal routes. The resulting nanomaterial was characterized using powder X-ray Diffraction Studies (XRD), Fourier Transform Infrared Spectroscopy (FT-IR), Scanning Electron Microscopy (SEM), Energy Dispersive X-ray Spectroscopy (EDX), High Resolution Transmission Electron Microscopy (HR-TEM), Vibrating Sample Magnetometry (VSM), X-ray Photoelectron Spectroscopy (XPS), UV-vis Diffuse Reflectance Spectroscopy (UV-vis DRS) and Photoluminescence (PL) techniques. The efficiency as a photocatalyst was investigated in the degradation studies of some selected organic contaminants such as Methylene blue (MB), Rhodamine B (Rh B), Methyl Violet (MV) and Basic Fuchsin (BF) in aqueous medium under visible light. The as-synthesized photocatalyst showed superior photocatalytic performance with 96% efficiency for each of MB, Rh B and MV degradation and 95% BF removal efficiency. The stability of the magnetically recovered photocatalyst was then explored from its recyclability studies in the degradation of MB. The spent photocatalyst showed increased agglomerated forms of the synthesized MnMoO₄/NiFe₂O₄ nanostructures.

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A Mediator Trust Model to Optimize the Security of IoT

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Abstract: IoT is used in all sectors. But in the case of security, there are many issues which need attention. Here in this paper, we propose a mediator trust model to reduce the various safety issues, consistency and reliability and develop a secure data processing and sharing IoT atmosphere. Here we have used mediators and agent platforms which will be constructed on all the nodes. In IoT, the mediator based node is autonomous, self-leading software and hardware assimilated system. With the introduction of the mediator technology, the performance of the node can be managed to optimize the working of the whole system. At first, we come up with the several issues which characterize the IoT system. And then we point out the problems because of which it is difficult to achieve a secure IoT environment. Then we give the design of the trustable mediator and agency. Finally, we suggest the architecture named TMIC (Trustworthy Mediator Implementation Chip) which is secure, less costly in respect of software and hardware for the functioning of the mediator. Our approach is to install the TMIC on the sensor nodes which will provide a reliable working environment for the agents/mediators. **Keywords:** IoT, mediator, agency, TMIC, n sensor.

1. Introduction

In today's world internet of things is an evolving model. It is playing an exemplary role in changing the technological world. IoT has transformed the real world objects into canny objects and has also tried to connect all the objects through the internet. In divergence with the current internet, the objects in IoT are embedded with sensors and the communication (i.e. sending and receiving data) between them takes place with the help of cloud (Tan L, Wang N. (2010). The IoT environment is completely different from the normal technological world. The IoT atmosphere has some characteristics like heterogeneity, self-sufficiency, scattering and ingenuousness, but it may lead to severe safety worries and negotiated integrity (Shen SB, Fan QL, Zong P, et al. 2009). Malicious nodes in the network can disrupt the normal functioning of the network; fake nodes try to present themselves as real sensor nodes and try to get the information by breaking into the network. As a whole we can say that the production and action of IoT systems come across additional severe security issues (Wu ZQ, Zhou YW, Ma JF, 2011). For reducing the various security issues and to increase the reliability of the nodes and to ensure that the information sharing takes place in a secured manner, we propose the trust model.

An agent or mediator is an entity with action, flexibility, reactivity, sociality, intelligence and other features according to the FIPA (Foundation for the Intelligent Physical Agent) (Sbi ZZ, 2000). For building a safety and protection model for IoT, using the agent/mediator technology, means that the mediator stages needs to be built on the sensor nodes (R. Want, 2006). Thus, it indicates that in the IoT atmosphere using a collection of dispersed, insecurely joined dispersed smart agents/mediators high- well-organized intra-to-inter-group collaboration can be achieved and solution can be produced to solve the various security issues and pretend the organizations of human culture. All the mediators may not have the same configuration. The mediators embedded on the various sensor nodes have less functionality and also the need for resource is very less as compared to mediators embedded on cluster servers which needs to function more functions and so we can say that the agents/

mediators embedded on sensor nodes gives better performance (P.P. Ray, 2016). The sensor nodes which are mediator based are autonomous, self-leading hardware and software system. Here we propose the introduction of mediator technology which will help in managing the resources and help in developing a secured system to get optimum performance.

2. Trustworthiness of IoT systems: An Analysis

In an IoT system, we find various kinds of nodes like sensor nodes, cluster nodes. The whole IoT system and the nodes have the following characteristics.

- Duplication of resources: in the system, there is a large no. of sensor and server nodes and sometimes the nodes may stop to work but this should not affect the functionality of the whole system (Crystal V, Dobre C, Pop F. (2013)).
- Redundant information: the sensor nodes gather data about the same entity and so the redundant information needs to be riddled (G. Mühl, I. Fiege, and P. Pietzuch, 2006).
- No centralized node: in some of the IoT environment, there is no any centralized node which can control the entire available nodes.
- Dynamic nodes: The nodes in the network join or leave the network on their own and at times do not provide services.
- Difference in volume: The quantity and quality is different for the hardware and software resources possessed by the nodes (G. Broll, et al, 2009).

In an IoT system it is difficult to achieve a reliable communication because of the following reasons:

- (a) Malicious data in the programs may be harmful for the smooth functioning of the network.
- (b) The useful information in the nodes may be stolen by some other malicious nodes (Zhao L, Wang FX, Liu ZP, Chang Z, 2003).
- (c) To protect the broadcast of information and data, effective security mechanisms are available. For the above mentioned problem of virus various options are available like digital signature, authentication, authorization, sandbox, proof code carrying, code inspection and audit.

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Study of vibrational spectra of monohalogenated acetylenes and their deuterated analogues using the U(4) algebraic model

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ABSTRACT

A detailed study on the vibrational spectra of monohalogenated acetylenes and their deuterated analogues has been reported in this work using the U(4) algebraic model. With detailed spectral analysis, it has been shown in this study that all the stable isotopes of monohalogenated acetylenes and their deuterated analogues can be approximated well using the U(4) algebraic model.

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1. Introduction

Due to their various industrial and natural importance, monohalogenated acetylenes have been the area of active research interest since their introduction to the known field of science. Several experimental studies, some along with their theoretical projections using the traditional approaches have been reported [1–23] so far on the vibrational spectra of various acetylene halides and their deuterated analogues in order to know their properties. But, as these molecules are very reactive in air, all their properties could not be known up to the mark of expectation till today. This is due to the fact that explosion, ignition or decomposition occurs as soon as these molecules come in contact with air. In addition, the traditional theoretical approaches have got their limitations in the study of vibrational spectra of a large (larger than diatomic) molecule [24–28].

In the study of vibrational spectra of polyatomic molecules, during recent years, a growing interest is seen in the use of the algebraic models [29,30]. Probably this is due to the fact that with respect to the traditional approaches, the algebraic models based on Lie algebra have some additional advantages [31–33] in the study of vibrational spectra of polyatomic (larger than diatomic) molecules. The algebraic models could overcome the limitations of the traditional approaches at least to some extent in some specific sectors [34–35].

Vibrational spectra of a few monohalogenated acetylenes were studied and reported so far using the algebraic models. F. Iachello et al. [36], Bernardes et al. and N. K. Sarkar et al. reported a detailed study [35–38] on the vibrational spectra of HCCF using the algebraic models. A limited study on the vibrational spectra of HCCCl was reported by E.S. Bernardes

and Hornos [39] using the algebraic approach. Up to date scenario in this regard, makes it clear that in algebraic approach a general and complete study on the vibrational spectra of halogenated acetylenes, their deuterated analogues and isotopes is still awaited. Based on the U(4) algebraic model, a detailed study on the vibrational spectra of HCC¹⁹F, DCC¹⁹F, HCC³⁵Cl, HCC³⁷Cl, DCC³⁵Cl, DCC³⁷Cl, HCC⁷⁹Br, HCC⁸¹Br, DCC⁷⁹Br, DCC⁸¹Br, HCC¹²⁷I and DCC¹²⁹I has been reported in this work. Through this study, it has been shown that with the help of an economic set of parameters, it is possible to approximate well the mentioned halogenated acetylenes and their deuterated analogues with the help of U(4) algebraic model in its strict local limit.

2. Review of the Theory

Monohalogenated acetylenes and their deuterated analogues are linear four atomic molecules. Detailed review of the theory regarding U(4) algebraic model as applied in the approximation of a linear four atomic molecule can be found in the earlier publication of the author [30]. In the approximation of a linear four atomic molecule, the U(4) algebraic model is based on the spectrum generating algebra (SGA)

$$U_1(4) \otimes U_1(4) \otimes U_1(4) \quad (1)$$

In the first step, first of all here, the three vibron numbers N_1 , N_2 and N_3 are assigned. The basic states of the symmetric irreducible representations of the SGA (1) is given by

$$|N_1\rangle \otimes |N_2\rangle \otimes |N_3\rangle \quad (2)$$

Expression (2) provides the Hilbert model space of the problem [32]. A complete sub-algebra chain of expression (1) is chosen at this state in

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A Routing Algorithm to Optimize the Energy Efficacy of Nodes in Internet of Things

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ABSTRACT

The Internet of Things (IoT) is a powerful example that has made advancement in the almost every arena of human life. Its primary aim is that of connecting even the most mundane objects to provide a comfortable lifestyle. Hence, one of the major factors in IoT is the security issue. In this paper we will try to optimize the energy problems which occur for securing Internet of Things. For example, using the RFID labels, sensors etc, IoT have volunteered out from its previous versions and has changed the internet into a harmonized Future Internet. But with these advancements arises the need for high energy consumption. Our main goal is to propose an energy efficient protocol to improve the energy efficiency of nodes thereby securing the IoT. The authentication of this procedure is established in an IoT atmosphere with separate C platform.

Keywords

IoT, RFID, sensors, protocol, energy efficiency.

1. INTRODUCTION

In today's world of internet, everything object can be connected with each other. But, in terms of network connectivity, all devices cannot be connected with the network, which limit the level of task. To make this task unlimited, and perform all the task in a smooth manner one to one connection is required between all the devices. But for this the present day internet is one of the constraint, which disrupts the connectivity. But IoT has emerged as one of the technology, which has enabled every individual object to communicate among themselves [1-3]. In the process of communication, information will spawn and we should ensure access control. IoT can be used in various fields of our daily life like health, transportation etc. Various sensors networks, RFID are the main ingredients for communication between object to object in IoT. For the Internet of Things to emerge successfully, it needs to go beyond the traditional computing and allow our daily objects to be connected with the environment.

In the IoT network, the nodes distributed in various parts of the network collect the information required by them and transfer among themselves [4-6]. For the transfer of information between the nodes, inadvertent energy is required by the starting node for forwarding the data packet which results in network partitioning inducing very high energy depletion. Thus, the network performance is basically exaggerated by the energy depletion [7]. To find the straight route between one hop to another, hop count is used by most of the routing protocols. However, in the millions of devices connected to the internet, the communication architecture and

the rate of data transfer cannot stand the energy required by the IoT devices.

2. PROBLEM IDENTIFICATION AND SIGNIFICANCE

In the IoT network, where only one or two devices are required for making the whole communication network, the nodes can be connected to each other very easily [8]. But if we want to deploy IoT network where we can ensure communication between the people and devices as well as with the devices themselves, then arise the need for a complex network and also this type of network needs to spread to all regions for definite tasks. Conversely, installing IoT devices universally with billions of consumers is a giant task [9].

With the advent of Internet of Things, various applications will be compressed. However, various factors like scale, network availability, consumer participation, exposure etc. will affect each type of applications. The applications can be categorized as follows: (i) Home (ii) Personal (iii) Healthcare (iv) Mobile.

For ensuring to give the best network for communication among the devices, we come through various challenges for connectivity, the supreme and noteworthy concern being the system energy intake.

Proper routing is required for the nodes to forward data collected from the various sensors to intermediary node. In the whole process of data transmission from the starting node to the target node, the nodes use vast quantity of energy which outcomes in energy waste and hints to network splitting. Therefore energy effectiveness is a vital concern which affects the whole network performance in the whole IoT network [10].

To allow the devices to transmit data effortlessly between them and the connected servers and other system we need an energy efficient routing in the network.

3. LITERATURE REVIEW

In this part, the features of the existing protocols are discussed. IoT is very successfully in gaining peoples attraction because of its wide variety of features. With this advent the data transfer rate has also increased day by day. For all this the network should have to be capable for the vast quantity of records transfer as because continuous use of clever devices hints to amplified data movement which the network can handle which results in service degradation Spirent's diameter testing application estimates the network node by node and thus helps to relate to the real-world conditions. Also this can be used to evaluate the working of new devices on the existing network. [11]. The Ad-

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Recent advances in Biotechnology with special reference to Plant Tissue Culture

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ABSTRACT

Biotechnology is a multi-disciplinary approach concerned with various aspects like Molecular Biology, Biochemistry, Biophysics, Plant tissue culture, Applied Microbiology, Biostatistics, and Nanotechnology. It has revolutionized plant sciences. Several achievements have been obtained in this connection. There are numerous complex challenges in plant biology; so it is important to improve existing plant characteristics for better crop performance, improving yield and stress tolerance in crops to adapt to changing environment. A primary goal of plant biotechnology is to continue human-driven crop evolution for higher and more sustainable food yields. Tissue culture as well as genetic engineering has enabled incremental crop improvement, including pest resistance and other input traits. There are many new functions such as biosensing, production of valuable compounds, alteration of plant metabolism etc. Genetic engineering directly manipulates the genome of an organism by the introduction of one or several new genes.

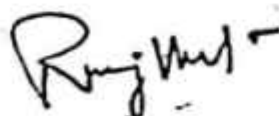
Keywords : Biofortification, nanotechnology, tissue culture

Introduction

Plant Tissue culture is based on the principle of totipotency. This technology is being widely used for large scale plant multiplication. Apart from their use as a tool of research, plant tissue culture techniques have in recent years, become of major industrial importance. Small pieces of tissue (named explants) can be used to produce hundreds and thousands of plants in a continuous process. Plant tissue culture is considered to be the most efficient technology for crop improvement by the production of somaclonal and gametoclonal variants. The micro propagation technology has a vast potential to produce plants of superior quality, isolation of useful variants in well-adapted high yielding genotypes with better disease resistance and stress tolerance capacities (Gaj, 2004; Sugiyama, 1999). As an emerging technology, the plant tissue culture has made significant contributions to the advancement of agricultural sciences in recent years and today it constitutes an indispensable tool in modern agriculture. Germplasm conservation is increasingly becoming an essential activity due to the high rate of disappearance of plant species. Tissue culture protocols can be used in this connection. Cryo preservation plays a vital role in the long-term *in vitro* conservation of essential biological material and genetic resources. Cryo bionomics is a new approach to study genetic stability in the cryo preserved plant materials. Embryo culture is a type of plant tissue culture that is used to grow embryos from seeds and ovules in a nutrient medium. In embryo culture, the plant develops directly from the embryo or indirectly through the formation of callus and then subsequent formation of shoots and roots. Conservation of endangered species can be attained by practicing embryo culture technique. Genetic transformation is the most recent aspect of plant cell and tissue culture that provides the mean of transfer of genes with desirable trait into host plants and recovery of transgenic plants. The technique has a great potential of genetic improvement of various crop plants by integrating in plant biotechnology and breeding programmes.

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A silver NP-dispersed water extract of fly ash as a green and efficient medium for oxidant-free dehydrogenation of benzyl alcohols†

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Herein, a green, efficient, and new catalytic system for dehydrogenative oxidation of benzyl alcohols using Ag nanoparticles (NPs) dispersed in water extract of fly ash (WEFA) has been developed. Various characterization techniques were performed to authenticate the formation of Ag@WEFA. The as-prepared Ag NPs (10–20 nm) were found to be dispersed in WEFA, as indicated by transmission electron microscopy (TEM) and scanning electron microscopy (SEM) images. With Ag@WEFA, a variety of substituted benzyl alcohols were efficiently converted to carbonyl compounds in high yields. All the reactions were deliberately carried out without using any ligand or hazardous organic solvent. This catalytic system involving WEFA is a genuinely new concept. It is, therefore, expected to attract attention from researchers working in the areas of sustainable chemistry.

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1. Introduction

The increasing amount of environmental concerns has led researchers worldwide to develop cleaner and greener reactions for organic transformations. Development of efficient, atom-economical, and selective reactions, which can be performed under safe and mild conditions, has merged out to be one of the prominent subjects in synthetic organic chemistry.

The oxidation of alcohols is one of the fundamental transformations in synthetic organic chemistry.^{1,2} The oxidation products are recognized to be essential intermediates in the manufacture of agrochemicals, fine chemicals, pharmaceuticals, and high-value commodity chemicals.³ With the increasing concern for economic and environmental acceptability, researchers across the world are putting significant efforts to accomplish this oxidation reaction with oxygen or hydrogen peroxides.^{4,5} Several excellent catalysts have been developed for environmentally benign oxidation of alcohols to carbonyl compounds. There are reports on the use of Au,⁶ Pd,⁷ Pt,⁸ Co,⁹ Ru,¹⁰ and Mn¹¹ among transition metal catalysts and TiMPCO¹² and mesoporous carbon nitride (mpg-C₃N₄)¹³ from the family of metal-free catalysts for these transformations using suitable oxidants such as H₂O₂ or molecular oxygen. However, from the safety and environmental point of view, the development of more atom economic catalytic systems that run efficiently without the use of molecular oxygen or hydrogen

peroxide would be more attractive. Therefore, oxidative transformation through an oxidant-free dehydrogenative route is of great significance.^{14,15} Dehydrogenative oxidation with the release of hydrogen gas in the absence of any oxidants must be a powerful route from the viewpoint of atom economy. To date, several nanoparticle-based catalytic systems have been reported to exhibit significant applications in these transformations.^{16,17} Hosseini-Sarvari *et al.* prepared nanosized Ag₂ZnO catalysts for oxidant-free dehydrogenation of primary and secondary benzyl alcohols to the corresponding aldehydes and ketones under atmospheric pressure.¹⁸ However, majority of these catalytic protocols have to be carried out under reflux conditions in organic solvents such as toluene. Moreover, they possess some unavoidable limitations such as troublesome catalyst recovery, requirement of acid or base additives, solvents, and involvement of high cost. Importantly, there is a serious need for a greener reaction medium involving lesser impact on environment and having features that are attractive from an industry viewpoint. From green chemistry perspective, it must be very important to develop a new catalytic system that can be used in a greener solvent such as water. In this context, use of water extract of natural feedstock in any organic transformation is of enormous significance as this methodology would eliminate any harsh acids or bases, harmful organic solvents, and other potentially harmful external reagents.^{19–21}

Utilization of waste in important organic transformations has been regarded as a significant approach among chemists. Fly ash, a coal combustion residue, has been reported to contain oxides of Si, Al, Ca, Fe, Mg, K, and Na as predominant constituents with trace amounts of B, Mo, Se, Sr, Mn, Ti, etc. Numerous organic transformations such as Claisen-Schmidt condensation,²² Knoevenagel condensation,²³ Beckmann

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Paederia foetida Linn. promoted synthesis of CoFe_2O_4 and NiFe_2O_4 nanostructures and their photocatalytic efficiency

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Abstract: A facile method of synthesis of cobalt ferrite (CoFe_2O_4) and nickel ferrite (NiFe_2O_4) nanoparticles (NPs) was developed using urea as a hydroxylating agent and *Paederia foetida* Linn. (family: Rubiaceae) leaf extract as a bio-temple. The synthesised ferrite NPs were characterised in a detailed manner by powder X-ray diffraction (XRD), transmission electron microscopy. Fourier transform-infrared spectroscopy and vibrating sample magnetometer analysis. The XRD patterns revealed the formation of cubic face-centred phase for both CoFe_2O_4 and NiFe_2O_4 NPs. These quasi-spherical particles of CoFe_2O_4 and NiFe_2O_4 were shown to have sizes in the range of 10–80 and 5–50 nm, respectively. The photocatalytic activity of metal ferrites was evaluated in H_2O_2 assisted oxidative degradation of methylene blue (MB) and rhodamine B (RhB) under irradiation of solar light. Both metal ferrite photocatalysts exhibited pronounced activity in degradation of MB and RhB, respectively, but relatively higher activity was observed for NiFe_2O_4 . After completion, the catalysts were recovered using an external magnet. Recycling of these recovered catalysts up to five times showed no noticeable change in the efficiency.

1 Introduction

Recently, transition metal ferrites (MFe_2O_4 ; M = Fe, Co, Ni, Mn, Zn, etc.) with cubic spinel structures are gaining much attention, because of their potential applications in various interdisciplinary areas [1]. The newer synthesis of spinel type nano-structured magnetic materials with the general formula $\text{M}^{2+}\text{Fe}^{3+}_2\text{O}_4$ (where $\text{M}^{2+} = \text{Mn}^{2+}, \text{Co}^{2+}, \text{Ni}^{2+}, \text{Cu}^{2+}, \text{Zn}^{2+}$ etc.) has become an important part of the modern ceramic research, due to their unique physical and chemical properties than that of their bulk counterparts. Spinel ferrites are known to be used in various technological applications in the past few decades viz. electronic devices, information storage, magnetic resonance imaging, drug-delivery technology, etc. [2–5]. Apart from these, ferrites have also been used for photo-degradation of organic dyes [6], as gas and humidity sensor materials in recent times [7, 8].

Owing to such a wide range of applications, several conventional methods have been developed to synthesise CoFe_2O_4 and NiFe_2O_4 nanoparticles (NPs) [9–11]. However, controlled size growth of NPs has always been a challenging task. Moreover, the above synthetic methods possess some drawbacks such as the requirement of higher processing temperature and relatively longer reaction time, etc. Therefore, use of naturally occurring leaf extracts as a bio-temple would not only overcome the above-mentioned disadvantages but may also provide better control on the growth and morphology of the synthesised NPs.

The work presented herein highlights the controlled synthesis of metal ferrite (M = Co, Ni) NPs using urea as a hydroxylating agent and *Paederia foetida* Linn (family: Rubiaceae) leaf extract as a bio-temple. Ammonia formed in the reaction mixture due to the decomposition of urea reacts with water to produce sufficient amount of hydroxide required for the precipitation of $\text{M}(\text{OH})_2$. Reports on the urea-assisted hydroxylation technique are hitherto unknown for the synthesis of CoFe_2O_4 and NiFe_2O_4 NPs. *Paederia foetida* Linn. is a traditional plant known to have immense medicinal value. The plant contains proteins, enzymes, polysaccharides, phenolic compounds and some other phytochemicals [12, 13]. Due to its easy availability and wide distribution in the northeastern part of India, the climber appears to be a promising way of synthesising metal ferrite NPs. Previously leaf extract of plants such as *Hibiscus rosa-sinensis* and green

source such as natural organic matter (NOM)-rich water [14, 15] have been reported to be used for the synthesis of metal ferrites but in general, use of plant mediated synthesis of metal ferrites have rarely been given any emphasis to date.

Various organic dyes released from textile and other industries lead to contamination of water and consequently a potential threat to our ecosystem [16, 17]. Therefore, it is quite essential to remove them completely from the environment. To date, several methodologies have been reported for the same. However, certain demerits prevail in these methods [18]. Suitable nanocatalysts do have a potential scope for the complete elimination of various polluting dyes from the aqueous environment.

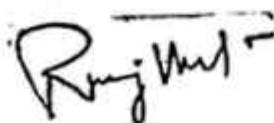
Zeolites [19, 20] and some expensive metal NPs like Au, Ag [21–25] and metal oxides [26] have been developed from time to time for the effective removal of such contaminants from wastewater. However, the utilisation of ferrites has been given more emphasis in the recent times for the removal, degradation or transformation of such contaminants because they are considered to be green and inexpensive [27, 28]. Moreover, ferrites are known to be stable, easy to synthesise, cost effective, non-toxic, magnetically separable and reusable catalysts that can be effectively applied for the treatment of contaminated water.

A comprehensive literature survey revealed that very few reports are accessible to date in which pure metal ferrites have been explored as catalysts for the oxidative degradation of organic pollutants and dyes [29]. H_2O_2 is considered to be highly advantageous from the environmental and economic point of view. Based on the aforementioned discussions on the benefits of use of ferrites and in continuation of our on-going research endeavour [30–32] on nanocatalysts and their applications, we wish to report herein a facile urea assisted synthesis of magnetic CoFe_2O_4 and NiFe_2O_4 NPs using *Paederia foetida* leaf extract as a stabilising agent and application of these materials as a photocatalyst in H_2O_2 -assisted degradation of dyes under solar light irradiation.

2 Experimental

2.1 Materials and physical measurements

The leaves of *Paederia foetida* plant were collected from the NIT Silchar campus. The leaves were washed thoroughly with




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UNDERSTANDING THE NATURE OF POVERTY IN SOUTH ASSAM: AN ASSET BASED APPROACH

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Sagarika Dey**

ABSTRACT

The conceptualization and measurement of poverty has undergone a distinctive change in the past two decades. Traditionally, money metric measures based on income or consumption expenditure have been employed in the assessment of poverty in third world countries. However, a drawback of the income based measures lies in their neglect of the underlying process of income generation which critically depends on the natural, physical, financial, social and human asset base of households. Consequently, the conventional measures failed to explain whether the observed poverty status of a household is a transitory phenomenon resulting from positive or negative stochastic events or is a persistent situation resulting from structural factors. The asset based measures of poverty (Carter and May 2001: 1987) and asset indices (Johnston and Abreu 2013: 1, 10-11) facilitate a more profound look into the nature and causes of poverty by enabling the decomposition of poverty into its stochastic and structural components. Following this approach, this paper utilizes

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Ruthenium(II) carbonyl complexes of P,P and P,O donor diphosphine ligands, $\text{Ph}_2\text{P}(\text{CH}_2)_n\text{PPh}_2$ and $\text{Ph}_2\text{P}(\text{CH}_2)_n\text{P}(\text{O})\text{Ph}_2$, $n = 2, 3$ and their activities in catalytic transfer hydrogenation reactions

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The polymeric precursor $[\text{RuCl}_2(\text{CO})_2]_n$ reacts with the ligands, P,P (a,b) and P,O (c,d), in 1:1 molar ratio to generate six-coordinate complexes $[\text{RuCl}_2(\text{CO})_2(\eta^2\text{-P,P})]$ (1a, 1b) and $[\text{RuCl}_2(\text{CO})_2(\eta^2\text{-P,O})]$ (1c, 1d), where P,P: $\text{Ph}_2\text{P}(\text{CH}_2)_n\text{PPh}_2$, $n = 2$ (a), 3(b); P,O: $\text{Ph}_2\text{P}(\text{CH}_2)_n\text{P}(\text{O})\text{Ph}_2$, $n = 2$ (c), 3(d). The complexes are characterized by elemental analyses, mass spectrometry, thermal studies, IR and NMR spectroscopy. 1a-1d are active in catalyzed transfer hydrogenation of acetophenone and its derivatives to corresponding alcohols with turnover frequency (TOF) of 75-290 h^{-1} . The complexes exhibit higher yield of hydrogenation products than catalyzed by RuCl_3 itself. Among 1a-1d, the Ru(II) complexes of bidentate phosphine (1a, 1b) show higher efficiency than their monoxide analogues (1c, 1d). However, the recycling experiments with the catalysts for hydrogenation of 4-nitroacetophenone exhibit a different trend in which the catalytic activities of 1a, 1b and 1d decrease considerably, while 1c shows similar activity during the second run.

Keywords: Ruthenium; Phosphine; Carbonyl; Transfer hydrogenation; Catalysis

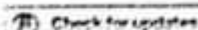
1. Introduction

The coordination chemistry of symmetric and unsymmetric diphosphine ligands is of interest because of their structural novelty, reactivity and catalytic activity [1-5]. However, unsymmetrical P,X donor diphosphine ligands exhibit capability of coordinating either as monodentate ($\eta^1\text{-P}$ coordinated) or bidentate chelating ($\eta^2\text{-P,X}$ coordinated) depending upon the

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Optical and static dielectric study of a terminally fluorinated liquid crystalline compound

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ABSTRACT

Optical and static dielectric studies on a terminally fluorinated liquid crystalline compound have been carried out. Measurements of temperature variation of refractive indices of the compound are done by using thin prism method. A four-parameter model is validated by fitting the experimentally measured values of refractive indices, birefringence and average refractive indices of the compound with the theoretical ones. Refractive index and density data are utilized for determination of orientational order parameter. The temperature variation of dielectric permittivities of the compound are measured by a LCR meter.

KEYWORDS

Density; dielectric permittivity; four-parameter model; orientational order parameter; refractive index

1. Introduction

Liquid crystalline compounds are very important for various technological applications. Of them the most prominent one is the Liquid Crystal Display (LCD) technology. For application purpose, liquid crystalline mixtures of several pure compounds are used so that required range of different physical parameters may be obtained [1]. Study of pure liquid crystalline compounds is essential for making more acceptable liquid crystalline mixtures to meet the specific requirement for particular applications.

Fluorinated nematic liquid crystals prove to be very useful components of liquid crystalline mixtures for various applications, especially in the field of liquid crystal displays [2]. By fluoro substitution in liquid crystals various properties such as melting point, phase transition temperatures, mesophase morphology, dipole moment, dielectric anisotropy, optical anisotropy, elastic constants, viscosity, etc. can be considerably tuned to meet the exact demand. Fluoro substituents are usually used in terminal and lateral locations. Terminally fluorinated liquid crystal compound is an active area of research for their use in liquid crystalline mixtures for active matrix displays [3] because of their high chemical and photo-chemical stability, their low viscosity and the positive dielectric anisotropy [4]. Therefore, a wide range of terminally fluorinated LC compounds have been synthesized and their various physical properties are studied by many research groups [2, 5-8].

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Optical and dielectric parameters of a laterally difluorinated phenylbicyclohexane liquid crystalline compound

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Abstract

The temperature variation of the refractive indices in the nematic range of a laterally difluorinated phenylbicyclohexane liquid crystalline compound was determined using the thin prism technique. Birefringence and effective geometry parameter of this LC compound was calculated from the measured refractive indices. Using a four-parameter model, the temperature variation of the refractive indices and birefringence was theoretically fitted. The compound is found to have low value of birefringence and high value of effective geometry parameter. Using refractive index data, three different methods were used in this work to obtain temperature dependence of order parameter, namely Vuks' method, Haller approximation method, and method based on effective geometry parameter. All of them show the same trend. The temperature variation of dielectric permittivities of the compound was done at frequency 1 kHz by an LCR meter. The temperature variation of dielectric anisotropy of the compound was calculated from the experimentally measured values of dielectric permittivities. The compound shows moderate negative dielectric anisotropy.

1 Introduction

Liquid crystals (LCs) are proved to be an important phase of matter both scientifically and technologically [1–3]. The simplest liquid crystalline phase is the nematic phase [4] which are primarily known for their vast applications in liquid crystal displays (LCDs) [5]. To obtain an optimal performance of any LCD device, a certain set of physical parameters of the liquid crystal material should be in particular ranges [6]. Among various important physical parameters, the nematic phase range, optical birefringence (Δn), and dielectric anisotropy ($\Delta\epsilon$) play a very crucial role in display application. The vertically aligned (VA) mode was introduced in 1998 in a monitor display [7] which requires LC materials with broad nematic phase range (from -40 to 110 °C), medium birefringence ($\Delta n \sim 0.1\text{--}0.2$), negative dielectric anisotropy ($\Delta\epsilon \sim -5$), low rotational viscosity ($\gamma_1 < 100$ mPa s), high thermostability, and photostability [8–10]. No single liquid crystal compound can fulfill all

the requirements of the displays. Typically mixture 10–20 compounds are required to achieve the desired material [7]. The study of physical properties of pure liquid crystalline compound is a prerequisite for obtaining a targeted liquid crystalline mixture of desirable ranges of different physical parameters. On the other hand, the study of physical properties of pure LCs is important from basic research point of view, making us enable to better understand the structure–property relationship, thereby helping us to design better materials for device applications.

The fluoro-substituted liquid crystals have played an important role in satisfying the demand of various types of liquid crystal displays [11]. Laterally multifluorinated LC compounds have potential applications in VA mode liquid crystal displays [8], thereby making investigation on these types of materials relevant.

In this work, optical and dielectric behaviour of a laterally difluorinated phenylbicyclohexane liquid crystalline compound is reported. Previous reports on this compound [12, 13] cover refractive index and dielectric study. However, these studies do not entail systematic temperature variation of various optical parameters and dielectric parameters. However, the knowledge of temperature dependence of various optical and dielectric parameters of liquid crystals is of large importance from the application point of view [14, 15]. We present the temperature variation of ordinary and

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863

Natural Flavonoids in the Prevention and Treatment of Lung Cancer: A Pharmacological Aspect

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Abstract: Deadly disease cancer has many types; among them, lung cancer is responsible for the highest number of cancer mortality. Existing therapies as well as drugs for treating lung cancer are not effective and are often associated with innumerable side effects and toxicities. For these reasons, researchers have been working on developing novel anti-cancer medicines from plants and other natural sources that have a high safety profile. Natural flavonoids are a polyphenolic group of phytochemicals extracted from plants and other plant-derived compounds. Natural flavonoids are gaining popularity due to their unique and priceless medicinal properties, including anticancer properties. Several researchers have already declared that flavonoids possess the ability to treat different cancers, particularly lung cancer. The bioactivity of natural flavonoids is mainly due to their structural diversity. Natural flavonoids fight against lung cancer by regulating redox homeostasis, upregulating apoptosis, pro-apoptotic factors, and survival genes, arresting cell cycle progression, autophagy, reducing cell proliferation and invasiveness, maintaining inflammation response, down-regulating anti-apoptotic factors, and targeting lung cancer signaling pathways. Flavonoids can act alone or synergistically with other agents to treat lung cancer. Due to these reasons, it is possible to use natural flavonoids as pharmaceutical leads to prevent and treat lung cancer.

Keywords: Cancer, lung cancer, natural products, flavonoids, pharmacology, phytochemicals.

1. INTRODUCTION

Plant-based natural drugs have been in use for the treatment of various diseases since the inception of human civilization [1]. In our today's world, the disease of cancer is the utmost threat to humanity. All over the world, people are suffering a lot due to cancer. Among the most common causes of death globally, cancer occupied the second position (~9.6 million mortalities in the last decade) [2]. Despite all the advancements in drug development for cancer treatment, some limitations are still there. Existing drugs face problems in their application and effectiveness and are often associated with severe side effects and toxicities, which may further deteriorate the patient's health [3]. Therefore, it is crucial to develop some new agents with antitumor activities, reducing the side effects of existing chemotherapy drugs [3]. For this purpose, various classes of phytochemicals have been tested from plants and other natural products against cancerous cells both in laboratory conditions as well as *in vivo* models [2].

2. NATURAL FLAVONOIDS

Phytochemicals are natural compounds produced by plants that can be used to treat various diseases, including cancer. Among them, flavonoids are the most promising anticancer agent and the most studied group of antioxidants. Major sources of natural flavonoids include plant-derived food and other natural health-promoting agents. Flavonoids are part of a large group of phytochemicals called polyphenols, which include 6000 members [4, 5]. In the plant kingdom, flavonoids probably existed more than 1 billion years ago. Flavonoids are available in large amounts in different plant products like roots, flowers, stems, fruits, bark, tea, vegetables, wine, and grains. Flavonoids perform a variety of functions in plants, e.g., pollination, pollen tube growth, seed dispersal, resorption of mineral nutrients, resistance to abiotic stresses, protection against UV rays, and help in allelopathic interactions [6]. Recently, natural flavonoids have attracted the attention of many researchers for their beneficial actions in disease prevention and are good contenders as pharmaceutical leads [7]. Polyphenolic groups show a very good spectrum of biological activities, including anticancer activity like antioxidant, anti-allergic, anti-mutagenic, antiviral, anti-inflammatory, anti-carcinogenic, and modulation of

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Optical and static dielectric properties of two nematogenic isothiocyanato-tolane compounds: a comparative study

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ABSTRACT

The optical and dielectric properties of two laterally monofluorinated isothiocyanato-tolane nematogens, which differ only on the position of fluorine atom in the core, have been studied as a function of temperature. A four-parameter model is validated by fitting the experimentally measured values of refractive indices, birefringence and average refractive indices of the compounds with the theoretical ones. The position of fluorine substituent in the rigid core have been found to have little effect on optical birefringence, but pronounced effect on dielectric anisotropy.

KEYWORDS

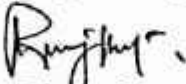
Dielectric anisotropy; four parameter model; nematogen; optical birefringence


1. Introduction

Liquid crystals (LCs) have got much attention due to their unique physical properties, which are responsible for their versatile commercial applications [1–5]. Nematic liquid crystals play dominant role in this regard. However, single component liquid crystal usually does not fulfill all the criteria for particular applications. Generally multicomponent liquid crystalline mixtures are used for device applications. Quantitative knowledge of physical parameters of pure liquid crystalline compounds is a prerequisite for obtaining a targeted liquid crystalline mixture to meet the specific demand for a particular application. Medium and high birefringence LCs are used in liquid crystal displays (LCDs) as well as in non-display devices such as reflection films and photo storage devices. In addition to visible and infrared applications, high birefringent liquid crystals are now being used in other spectral regions such as THz and GHz regions for various devices such as light shutters, shifters, attenuators, filters, electronic lenses, delay lines, antennas, varactors, laser beam steerers, etc. [6].

The physical properties of LCs are determined by all structural elements (side chains, rings, linking groups, terminal groups) [7]. Isothiocyanato-tolane (NCS-tolane) based LC compounds are of considerable interest since they are expected to show enhanced birefringence due to extension of molecular conjugation along with moderate viscosity and good thermal, chemical and photochemical stability [8]. However, a major technical challenge of the NCS compounds is that these compounds tend to form smectic phase [9, 10]. Lateral fluorination may be used to destroy smectic phase [11] at the expense of

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Effect of acetone fraction of *Ottelia alismoides* on the G2/M cell cycle arrest and apoptosis in the human carcinoma cell lines

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ABSTRACT

Ethnopharmacological relevance: The North-eastern parts of India have immense therapeutic flora, *Ottelia alismoides* is an aquatic plant that has been in use for a long time in traditional medicine for treating diseases like cancer, tuberculosis, diabetes, febrifuge, hemorrhoids, and rubeolent. In lung and skin carcinoma cells with a high rate of proliferation and metastasis including drug resistance and non-specific target activity, generates important challenges towards their treatment strategy. Thus, finding novel therapeutic targets to treat lung and skin cancer progression is essential to enhance the patients' survival with treatment.

Aim of the study: The purpose of this study was to evaluate the apoptotic potential of acetone extract of *O. alismoides* (L.) Pers. (OA-AC) and to identify the compounds responsible for this effect. HPLC-MS-QTOF analysis of the extract has been undertaken along with in-silico molecular docking analysis of the identified compounds.

Materials and methods: A549 and A431 cells were treated with acetone extract of *O. alismoides* (OA-AC) at 24 h and 48 h exposure and cell cycle phase distribution was evaluated and also apoptosis induction activity was evaluated by OA-EtBr staining and Mitochondrial outer membrane potential assay. Western blotting was performed for the evaluation of apoptotic protein expression. At last, the HPLC-MS-QTOF analysis of OA-AC was analyzed to identify the compounds responsible for the apoptotic activity of the extract.

Results: The cell cycle phase distribution analysis in A549 and A431 cells at 24hrs exposure with 10 µg/mL and 25 µg/mL of OA-AC showed a potent arrest or blockage at the G2/M phase of the cell cycle with reduced expression of cyclin B and p-Cdc2. At 48 h exposure, apoptosis was observed in these cancer cells with elevated expression of Bax, p21 and cleaved caspase 3 and reduced expression of the Bcl2.

Conclusion: AO-EtBr staining of these cancer cells reveals that the death induced by OA-AC was apoptotic in nature with depolarization of mitochondrial membrane due to loss or damage of the mitochondrial membrane. The HPLC-MS-QTOF analysis of OA-AC depicted 14 major isolable compounds and molecular docking analysis displayed 4 compounds that might act as an inhibitor of cyclin B for G2/M phase arrest that leads to apoptotic induction in the cells.

1. Introduction

In modern-day medical structures, various medication systems have been developed for treating cancer, and searching for anticancer

therapeutics from a natural product is one of the novel approaches. Bioactive secondary metabolites or natural products have gained much attention in the prevention and treatment of carcinogenic conditions as they act on a specific target with minimal or without toxicity to body

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Grammar Beyond Recipe

Sudip Sinha

ABSTRACT

The mystery that surrounds grammar is not grammar's own in the sense that it is not generated from within grammar itself. What obscures grammar, what ails our true appreciation and understanding of it is our erroneous approach to it, which instead of permeating the core of grammar, the essence, loses itself in the web of rules and regulations, the surface reality. The present article emphasizes that it is time we moved away from such a misleading approach that presents grammar as an arid, contrived, and lifeless thing, in order to realize the beauty of grammar, how lifelike it is.


Keywords: Grammar, Addressivity, Utterance, Usage, Rules, Speech communication, Context, Nativization

Introduction

"What is grammar?" If this question is posed to a commoner, he would probably scratch his head and reply that it is nothing short of a jigsaw puzzle. The connoisseur, on the other hand, would not mind rambling on about it, tirelessly pointing out its different facets, highlighting its nuances, all of which ultimately leading to establish this impression that grammar is a treasure trove of rules and principles, a storehouse of formulas that need to be assiduously explored and studied, and then to be practiced hard in order to realize the full efficacy. This has been the authoritative understanding of grammar that has perpetually predominated the budding minds from generation to generation. And it is unfortunate that it is thought/fashioned so, for this notion undermines the very capacity of language to be rooted in life. The point of view that can elucidate and throw further light on this matter here comes from William Somerset Maugham. In his autobiographical work *The Summing Up*,

Maugham, the great British writer of the 20th century, talks at length about the dual facets of the English language: one that is overly theoretical, that strictly adheres to logic, almost in a slavish way, and the other, racy, vigorous, exuding common sense, which breathes life into the language. He discerns the propensity to overemphasize the former, the strictly grammatical one, which is sheer rule based, formulaic and, in that sense, pretentious and affected, at the expense of the latter that stems from our day to day life, which he refers to as usage. In contrast to the common tendency, he declares, in an unabashed way, his preference for an expression which is simple and lifelike over one which is grammatical, asserting that grammar, first and foremost, is "common speech formulated" (30). This shift in emphasis from artificial rules to usage beckons to a change in usual approach to dealing with grammar itself. It asserts the need for a grammarian to address the life situations before he addresses grammar itself for it is the context which decides the rules


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Enhanced blue-shift of the optical band gap in Cd-doped ZnO nanoparticles

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Structural, Electrical and Optical properties

ABSTRACT

Nanoparticles of ZnO prepared through an inexpensive chemical route were doped with controlled quantities of Cd in wt%. The samples were found to be polycrystalline in nature which is confirmed by XRD. They also matched with their respective Powder Diffraction Data files. Morphological and compositional studies were conducted using FESEM to confirm the grain size, texture and doping. Frequency dependent impedance spectroscopy demonstrated that the ac conductivity increases with frequency but decreases with increasing cadmium concentration. Analysis on the samples shows that the absorbance does not significantly change with doping which is further established from the bandgap calculations using the reflectance graphs. Contrary to the common observation, the optical band gap of Cd-doped ZnO is blue-shifted from 3.47 to 3.56 eV as the doping weight percentage is increased to 3%. This can also be confirmed in FTIR analysis as signatures of new peaks in doped samples are obtained. From FTIR spectra it has been observed that the vibrational modes of the doped samples are around 473 cm^{-1} and 475 cm^{-1} . It also confirms a new peak which is due to defects created by incorporation of Cd in the host lattice.

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1. Introduction

Zinc originates from the d-block element of the periodic table wherein this group; in each case the d orbitals are filled. Group IIIB elements decrease in electropositive tendencies with the increase in atomic number; although the variation is not marked between zinc and cadmium. Zinc in general, readily dissolves in dilute acids but in pure form they are much more resistant to attack than in commercial metal. Zinc and cadmium form various compounds encompassing direct links to carbon, as well as sulphur, nitrogen, etc. Zinc appears to form greater stable links with oxygen compared to cadmium [1]. ZnO belongs to the group of hexagonal wurtzite, 6-mm symmetry and also have a wide band

gap ($E_g = 3.37$ eV at room temperature). ZnO has been used in a varied range for device applications. It finds use due to its semiconducting electrical, optical and piezoelectric properties [2].

Metal oxide semiconductor films have been widely studied and have received significant attention in last few decades due to their opposite optical and electrical properties. Many of them are worthy contenders for transparent conductive oxide films. ZnO is one among them. ZnO is a metal oxide semiconductor suitable for use in optoelectronic devices. It is a substitute material to indium tin oxide and tin oxide, which was being used all these days [3]. For toxic and combustible gas sensing applications, zinc oxide is an important oxide semiconductor. ZnO gas sensor elements have been made-up in various forms, such as, single crystals, thin films, thick films, sintered pellets and heterojunctions [4].

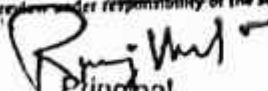
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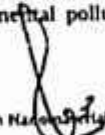
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AN EXTENSIVE REVIEW ON MEDICINAL PLANTS IN THE SPECIAL CONTEXT OF ECONOMIC IMPORTANCE

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ABSTRACT

Our health-care system would be incomplete without the use of medicinal herbs. In the days before modern medicine, several communities created medical knowledge systems known as "traditional medicine," "indigenous medicine" or "folk medicine." The medicinal properties of plants and plant-based products are widely accepted. There are a variety of medical approaches available across the world, including allopathic, homeopathic, Ayurvedic, and Chinese. The developed communities each have their own *Materia Medica*, which compiles thorough data on many plants used as medicines. According to current estimations from the field of botany, there are somewhere between 2,50,000 and 3,50,000 distinct plant species in existence. It is estimated that 35,000 unique species are used to cure a wide range of ailments in diverse places throughout the world. Based on general popularity among all ages, phytopharmaceuticals are an integral part of worldwide business and the global economy. According to a globe news wire study, the global herbal medicine market is estimated to be 550 billion dollars by 2030, up from 83 billion dollars in 2019. China and India lead the global herb market. China exports 120,000 tonnes of herbal remedies annually, followed by India with 32,000 tonnes. Europe is the world's largest importer of medicinal plants (MP), taking in over 400,000 tonnes annually to fulfill local demand. In this review, we have discussed about the MP and their economic importance in global market.

Keywords: Medicinal plants, Economic importance of medicinal plants, World economic market of traditional medicine, Import export of traditional medicine, Medicinal plants and human health.

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INTRODUCTION

Plants have an essential part in the health of the vast majority of people worldwide. Approximately 2 million traditional health practitioners in India employ medicinal plants (MP) to treat a variety of diseases [1-4]. The use of therapeutic plants dates back to the beginning of human history [5-7]. In the form of traditional and folkloric medicine, the history of a plant is based on the extensive experiences of a large number of different healers, which may have been passed down from ancestors or evolved via the author's own experiences over the course of time [8]. Importantly, the profound knowledge contained in this natural medicinal resource has not been tainted by any recent cultural upheavals. Therefore, none of the two existing methods of therapy can normally stake a claim to having invented it. Examples of well-developed systems of treatment include traditional techniques of therapy such as the Ayurvedic, homeopathic, and allopathic systems of medicine [9-12]. These methods of treatment differ from one another in both ideas and processes. *Materia Medica* is a compendium of extensive information on a range of plants that are used for medicinal reasons in more developed countries [13]. When this natural human pharmacy is combined with the incredible progress being made in other fields of medical research today, it surely provides the framework for a revolution in the traditional health-care system that is much needed.

Botanical research estimates that there are between 2,50,000 and 3,50,000 different plant species on the world. On the other hand, it is only stated that 35,000 distinct species are employed for the treatment of a variety of illnesses in various regions of the world [14]. Because these plants are utilized almost exclusively in their unprocessed or semi-processed form, and because they are frequently combined, quality control testing and stringent clinical studies are required for scientific justification [15,16]. According to the findings of a study [16-18], researchers estimated that only around 15% of MP had undergone

phytochemical analysis, while only about 6% had undergone biological screening. The remainder of the plants was left alone, which means that this treatment method has a huge amount of potential when it comes to the development of new and more efficient medicinal agents.

On the basis of widespread approval among people of all ages, phytopharmaceuticals are depicted as an essential component of international commerce and the global economy [19]. It was projected that the overall worldwide herbal industry for medications derived from plants was worth 18 billion dollars in 2005, in 2019 it increase to 83 billion dollar and according to the globe news wire report, it is expected the global herbal medicine market will be 550 billion dollar by 2030 [20,21]. It should come as no surprise that China and India dominate the worldwide market for the trading of herbs. It is projected that China exports more than 120,000 tonnes of herbal medications each year, followed by India with an export volume of roughly 32,000 tonnes. Europe, on the other hand, is the world's largest importer of MP, bringing in roughly 400,000 tonnes each year from a range of European nations to meet local demand for herbal remedies [22,23].

The high trust that the English population has in natural medicines was reflected in a report that was presented to the British parliament. In 2002, residents of the United Kingdom visited the clinics of 50,000 herbal practitioners, spending a total of 126 million pounds [24]. There has been a noticeable shift toward the increased use of herbal goods in the United States [22], and the overall market for herbal products is 230 billion dollar in 2021 and was projected to be worth 430 billion dollar in 2028. Over the course of recent history in the United States of America, there has been a discernible rise in the use of various herbal cures. Countries in Europe have reported experiencing the similar pattern of events. It is projected that over-the-counter (OTC) sale of herbal remedies have generated close to 73.4 billiondollars in revenue in 2020 (Fortune Business

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Enhanced blue-shift of the optical band gap in Cd-doped ZnO nanoparticles

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ABSTRACT

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1. Introduction

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Metal oxide semiconductor films have been widely studied and have received significant attention in last few decades due to their opposite optical and electrical properties. Many of them are worthy contenders for transparent conductive oxide films. ZnO is one among them. ZnO is a metal oxide semiconductor suitable for use in optoelectronic devices. It is a substitute material to indium tin oxide and tin oxide, which was being used all these days [3]. For toxic and combustible gas sensing applications, zinc oxide is an important oxide semiconductor. ZnO gas sensor elements have been made-up in various forms, such as, single crystals, thin films, thick films, sintered pellets and heterojunctions [4].

The development of gas sensors, is currently being carried out extensively as because environmental pollution and security in

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REVIEW ARTICLE

Natural Flavonoids in the Prevention and Treatment of Lung Cancer: A Pharmacological Aspect

Rajat Nath¹, Chandrima Das¹, Sibashish Kityania¹, Deepa Nath², Subrata Das¹, Manabendra Dutta Choudhury¹, Jayanta Kumar Patra³, Anupam Das Talukdar^{1,*}¹Department of Life Science and Bioinformatics, Assam University, Silchar, Assam, India; ²Department of Botany, Guru Charan College, Silchar, Assam, India; ³Research Institute of Biotechnology & Medical Converged Science, Dongguk University, Republic of Korea

Abstract: Deadly disease cancer has many types; among them, lung cancer is responsible for the highest number of cancer mortality. Existing therapies as well as drugs for treating lung cancer are not effective and are often associated with innumerable side effects and toxicities. For these reasons, researchers have been working on developing novel anti-cancer medicines from plants and other natural sources that have a high safety profile. Natural flavonoids are a polyphenolic group of phytochemicals extracted from plants and other plant-derived compounds. Natural flavonoids are gaining popularity due to their unique and priceless medicinal properties, including anticancer properties. Several researchers have already declared that flavonoids possess the ability to treat different cancers, particularly lung cancer. The bioactivity of natural flavonoids is mainly due to their structural diversity. Natural flavonoids fight against lung cancer by regulating redox homeostasis, upregulating apoptosis, pro-apoptotic factors, and survival genes, arresting cell cycle progression, autophagy, reducing cell proliferation and invasiveness, maintaining inflammation response, down-regulating anti-apoptotic factors, and targeting lung cancer signaling pathways. Flavonoids can act alone or synergistically with other agents to treat lung cancer. Due to these reasons, it is possible to use natural flavonoids as pharmaceutical leads to prevent and treat lung cancer.

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1. INTRODUCTION

Plant-based natural drugs have been in use for the treatment of various diseases since the inception of human civilization [1]. In our today's world, the disease of cancer is the utmost threat to humanity. All over the world, people are suffering a lot due to cancer. Among the most common causes of death globally, cancer occupied the second position (~9.6 million mortalities in the last decade) [2]. Despite all the advancements in drug development for cancer treatment, some limitations are still there. Existing drugs face problems in their application and effectiveness and are often associated with severe side effects and toxicities, which may further deteriorate the patient's health [3]. Therefore, it is crucial to develop some new agents with antitumor activities, reducing the side effects of existing chemotherapy drugs [3]. For this purpose, various classes of phytochemicals have been tested from plants and other natural products against cancerous cells both in laboratory conditions as well as *in vivo* models [2].

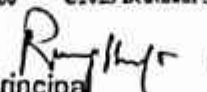
2. NATURAL FLAVONOIDS


Phytochemicals are natural compounds produced by plants that can be used to treat various diseases, including cancer. Among them, flavonoids are the most promising anticancer agent and the most studied group of antioxidants. Major sources of natural flavonoids include plant-derived food and other natural health-promoting agents. Flavonoids are part of a large group of phytochemicals called polyphenols, which include 6000 members [4, 5]. In the plant kingdom, flavonoids probably existed more than 1 billion years ago. Flavonoids are available in large amounts in different plant products like roots, flowers, stems, fruits, bark, tea, vegetables, wine, and grains. Flavonoids perform a variety of functions in plants, e.g., pollination, pollen tube growth, seed dispersal, resorption of mineral nutrients, resistance to abiotic stresses, protection against UV rays, and help in allelopathic interactions [6]. Recently, natural flavonoids have attracted the attention of many researchers for their beneficial actions in disease prevention and are good contenders as pharmaceutical leads [7]. Polyphenolic groups show a very good spectrum of biological activities, including anticancer activity like antioxidant, anti-allergic, anti-mutagenic, antiviral, anti-inflammatory, anti-carcinogenic, and modulation of

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A study on impact of community participation on health care promotion of Barpeta District of Assam

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Abstract--Health is an important element of human development. India to arrive WHO's slogan 'Health for All' amongst different ways also included community participation as an important tool to arrive health issues from the grass root level. Community participation and its important role on health is found in different studies for different parts of India, while with respect of Assam a very less studies were there. The present study is an attempt to find how far community participation was successful to promote health particularly of the Barpeta district of Assam. The study took the participation of members of panchayats in health care activities as the community participation. Mean health participation index and mean awareness score on 0 to 1 scale is calculated to examine community participation on health development. It is found from the study that community participation on health had positive linkages with the increase in awareness of the members of the panchayats about the available health care services and their roles and functions on delivery of health services. Absence of proper guidelines for health participation, lack of proper coordination among the panchayat members and district health centres etc, lead to absentia nature of health participation of panchayats.

Keywords--Community participation, Health care services, Panchayats, Rural health.

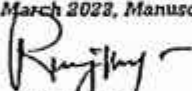
Introduction


Community participation in simple words implies a group of people having similar interest coming together to solve their common problems. When a group of people unite together to form a community, they can address the different issues they have in any sphere of life, say economic, social, political etc. Different definitions are there on community participation. According to WHO (WHO, 2002) the term

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Pharmacology and Ethnomedicinal Potential of Selected Plants Species from Apiaceae (Umbelliferae)

Gitishree Das¹, Subrata Das², Anupam Das Talukdar², Chidambaram Kulandaisamy Venil³, Sankhadip Bose⁴, Sabyasachi Banerjee⁵, Han-Seung Shin⁶, Erick P. Gutiérrez-Grijalva⁷, J. Basilio Heredia⁸ and Jayanta Kumar Patra^{1,*}

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Abstract: *Background:* The Apiaceae or Umbelliferae is one of the largest families in terms of species representation in the plant kingdom. It is also a prominent family in the field of phytochemicals and pharmacology. The family is also quite prominent in the production of spices and condiments and food supplements in nutrition, aside from the potential of species in the family to induce apoptotic, antimicrobial, antitumor, and hepatoprotective activities.

Objective: This work presents a detailed structural elucidation and functional aspects of phytochemicals from the Apiaceae or Umbelliferae family.

Methods: Furthermore, the application of members of this family in traditional and modern pharmacology is emphasized. This review also highlights the linkage of phytochemicals used in the conventional system of medication for the development of novel therapeutics through a chain of pre-clinical and clinical trials.

Conclusion: This study may represent a valuable step ahead in the clinical development of natural drugs for curing several ailments, including respiratory and virus-related diseases.

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Keywords: Apiaceae, Umbelliferae, functional foods, pharmacology, anti-viral, clinical trials.

1. INTRODUCTION

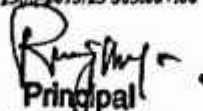
Medicinal plants and herbs are a source of raw materials for producing drugs, nutrition, beverages, spices, repellents, flavor, cosmetics, and perfumes. Therefore, they have attracted the global attention of academia and diverse industries. Currently, commercial productions of drugs from plant derivatives are generated by employing modern technologies as alternatives to traditional practices. Among the diversified lineage of floras and herbs, the Apiaceae category is largely popular in temperate upland areas.

This family, comprising flowering and aromatic plants of more than 400 genera, is cultivated globally to satisfy various needs, such as foods, vegetables, herbs, and medicines. Their hollow stems, tap-roots, and flat-top flowers, which are known as umbels, classify Apiaceae. The most significant vegetable plants in this family are carrots, celery, parsley, and parsnip, while the plants with medicinal and aromatic properties are coriander, cumin, fennel, and anise, among others.


Plants of the Apiaceae family are usually herbs of either annual, biennial, or perennial type; the herbs may be hefty (*Bupleurum*, *Heracleum*, *Angelica*) and rarely shrubs with an aromatic odor. They are also famous for their flavors and also as a reservoir of resin, oil, and mucilage [1]. Acimovic *et al.* reported the diversified uses of these plants as home remedies to deal with numerous illnesses [2]. Their usages in

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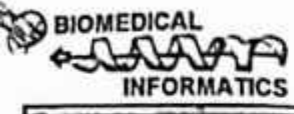
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2021



Molecular docking analysis of flupenthixol and desmethylastemizole with the apoptotic regulator proteins CFLAR and TRAF2 linked to lung carcinoma

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Abstract:

It is known that molecular changes in apoptotic genes due to mutation may cause disruption of apoptotic pathway resulting in an abrupt increase in cell proliferation. Therefore, it is of interest to identify compounds that could potentially replenish the changes in the apoptotic pathway, resulted from mutation. The gene network analysis using the Network Analyzer Plugin of Cytoscape (3.5.1) shows CFLAR and TRAF2 as influential genes in the apoptotic pathway. Mutation in these genes brings loss in apoptotic property of a cell and thus increases the cell proliferating activity. Thus, data on the molecular docking analysis of four natural compounds from *Ottelia alismoides* (L) Pers with the two target proteins were reported. Flupenthixol and desmethylastemizole was found to be two efficient ligand molecules based on ligand-target interaction. In stereochemical quality assessment, the Ramachandran plot analysis of receptors indicates the better stereochemical characteristics for receptor-ligand interaction.

Keyword: Molecular docking, CFLAR, TRAF2, apoptosis, lung carcinoma, mutation.

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Intonation: The Sound of Sense and Feelings

Sudip Sinha

ABSTRACT

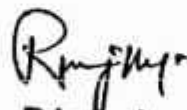
In our utterances every day, every time there is an intense, undeniable presence of something other than the voluminous words. It is the constantly varying pitch of the voice that comes through every time we utter words. We call this varying pitch, this unmistakable tune intonation. The present article looks into the nature of intonation in order to throw light on how this constant change in the tone of our voice is caused and regulated by the innermost movements – our attitudes and emotions. The article also focuses on the difficulty in setting rules as to the usage of intonation in English – a fact which makes learning it an arduous procedure.

Keywords: Intonation; Voice and Pitch; Tonic syllable; Attitude and emotion.

Introduction

Sound evokes emotion. Why this is so – this question has led science, particularly neuroscience, into extensive research that concludes by attributing this phenomenon to the existing anatomical connection between the auditory cortex of our brain and the large array of limbic and Para limbic structures responsible for the generation of effective activity. A detailed understanding of this scientific exploration is provided by Cook (2002). But away from the methodical study of science, general observation of life around has always substantiated the allure of the sound among all the creatures on earth. Whether it is a dog listening to Beethoven, or a sea mammal eliciting sound to hunt, navigate and communicate, or a primitive man taking recourse to auditory signals – before he could learn to make use of the visual images – to express, and assert himself, sound has always been an elicitor of sense and emotion. And it continues to be so.

However, sound can be a burden too, a sensory overload. In our day-to-day life, there are numerous occasions when we find ourselves reduced to the receiver of so much noise and cacophony, struggling to find our way through it all into some sort of meaning, desperately trying to hang onto the sound of the words uttered, or as an even more earnest approach, leaning our ear in an effort to capture the vital, all important sound, the tone of the voice for a more nuanced appreciation of the meaning produced. That it is not only the sound of the words but the sound of the voice too that holds the key to meaning – phonologists have known it since ages and hence they on their part have insisted on the tone of the voice as an important generator of meanings, specifically the ones that arise from deep within, from our innermost recesses, that reflect our attitude and resonate the emotional content. In phonological parlance, this tone of the voice is known as intonation.



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Intonation: The Sound of Sense and Feelings

Sudip Sinha

ABSTRACT

In our utterances every day, every time there is an intense, undeniable presence of something other than the voluminous words. It is the constantly varying pitch of the voice that comes through every time we utter words. We call this varying pitch, this unmistakable tune intonation. The present article looks into the nature of intonation in order to throw light on how this constant change in the tone of our voice is caused and regulated by the innermost movements – our attitudes and emotions. The article also focuses on the difficulty in setting rules as to the usage of intonation in English – a fact which makes learning it an arduous procedure.

Keywords: Intonation; Voice and Pitch; Tonic syllable; Attitude and emotion.

Introduction

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Investigation of groundwater and soil quality near to a municipal waste disposal site in Silchar, Assam, India

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Abstract

Unscientific management of municipal solid waste is one of the direct sources of contamination in developing countries, such as India. The present investigation carried out during Oct–Dec 2019 attempts to assess the parameters, such as quality of groundwater and soil along three depths (0–5, 5–15 and 15–30 cm), in proximity to a dumping site in Silchar, a rapidly evolving city of North-East India. Standard protocols of soil and water quality assessments were carried out. The pH values of the surface soils were found to be slightly acidic. Decrease in acidity with increasing depth was observed in the study site. The relative abundance of the analyzed elements at all soil depths was $Zn > Fe > Ni > Cu > Cr$. Weak correlation between the concentration of Cu, Fe and Zn, and the bulk density of the soil highlighted the micronutrient status of the soil. The impact of the nearby dumpsite on trace element contamination is indicated by the ‘extremely contaminated’ status of the soils with respect to geo-accumulation index. Majority of the groundwater samples exhibited pH levels below the desired limits, making it unfit for consumption by local communities. While Fe, Cu and Ni levels in groundwater samples exceeded the guideline values, Cr and Zn concentrations were found to be within limits except one sample. Principal Component Analysis of the observed data was carried out to ascertain the predominant sources of contamination. The observations indicate the negative impacts of nearby dumpsite on environmental parameters, such as groundwater and soil quality, as highlighted in this research.

Keywords Contamination · Groundwater · Soil · Micronutrients · Environmental management

Introduction

Huge rise in waste generation in correlation with rising trends in urbanization and population has been observed across the world since last few decades. Municipal solid waste (MSW) management has been increasingly challenging in emerging urban spaces of Indian subcontinent. Recent times have seen exponential population growth, high population density in urban areas, diverse culture, changing food habits, and lifestyles as well as astronomical rise in biomedical waste generation as a result of COVID-19 pandemic in India (Kumar and Agrawal 2020). Open dumping of MSW is a common disposal method employed in developing countries (Mor et al. 2006; Menikpura and Basnayake 2009). Waste generation dynamics has changed over the years in ‘transformed cities’ which has undergone rapid population growth and industrial development over the last decades resulting in direct and indirect impacts over environmental health

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Atmanirbhar Bharat and the Development Perspective of 'Seetal Pati' Weavers of Karimganj District: Revisiting in terms of Gandhian vision of Self-contained Community

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Abstract: The main purpose of this paper is to examine the development perspective of an indigenous rural crafts that being practiced from generation to generation with inherited skill in a very much remote and agriculturally backward area of Karimganj district, Assam. Even today, for a large section of villagers in the study area, 'Seetal Pati' crafts is the only source of livelihood. It has been observed that the socio-economic conditions of the weavers associated in the profession of seetal pati crafts continues to plague in the absence of proper agricultural and industrial development. Against this backdrop, an attempt has been made to examine the present status of the weavers of seetal pati crafts in one hand and the possible way forward for its development on the other hand. Besides, revisiting the Gandhian concept of Self-contained community and the recent initiative of Atmanirbhar Bharat under the leadership of Hon'ble Prime Minister Narendra Modi, the study finds that this indigenous rural crafts industry has a tremendous scope for its development. The study uses both primary and secondary data sources and the descriptive statistics have been used for data analysis wherever necessary.

Keywords: Atmanirbhar Bharat, Seetal Pati, Rural Crafts, Self-contained Community, Development.

BACKGROUND OF THE STUDY

The main purpose of this paper is to examine the development perspective of an indigenous rural crafts that being practiced from generation to generation with inherited skill in a very much remote and agriculturally backward area of Karimganj district, Assam. Even today, for a large section of villagers in the study area, 'Seetal Pati' crafts is the only source of livelihood. Literally the scientific name of Seetal Pati (cool mat) is 'Schumannianthus dichotomus' and it was firstly described by William Roxburgh which is typically found in riparian areas. It is a rhizomatous plant with an erect and glossy green stem attaining a height of 3-5 meter and a diameter of up to 20 mili meter. The stems are leafy and dichotomously branched from which seetal pati are made by the artisans. In other words, traditional artisans make strips from the outer portion of the stem including the epidermal part. After processing the split strips of Mutra plants are plaited into mats and other useful products like prayer mats, baskets, bags, etc. The strips from the pith portion are used as binding materials, and thus a section of rural people are exclusively depends on this profession for their livelihood. However, over the years it has been observed that the socio-economic conditions of the weavers associated in the profession of seetal pati crafts continues to plague in the absence of proper agricultural and industrial development. The seetal pati / cool mat weaving practices thus can become a potential enterprises


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Performance Comparison of Multiple ANN Optimizer on IoT-enabled Sensor Fire Dataset

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Abstract: In today's world, fires in homes and commercial places are a serious problem that can harm the local environment as well as jeopardize people's property and lives. This study predicts the sensor dataset gained from an integrated sensor framework with an artificial neural network. The major goal of this research was to identify a convenient way to encode input data that balanced information loss with simplicity. This paper developed an Artificial Neural Network (ANN) model and applied it to the fire dataset collected from the Integrated Sensor System (ISS). Every neuron of the model will learn and hold weights that weigh information, which provides better accuracy. To mitigate loss functions and improve accuracy, various activation functions such as Sigmoid, Relu, and optimizer Stochastic Gradient Descent (SGD), Adam, and Adamax are used in the designed model. The results demonstrated that the prediction accuracy of the ANN model with Adam as the optimizer is better than that of the other two optimizers. The findings also show that the ANN model performs well in terms of prediction accuracy and is also better suited to the sensor fire dataset.

Keywords: Sensor dataset, fire detection, ANN, SGD, adam, adamax.

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1. Introduction

An Artificial Neural Network (ANN) is a mathematical model that can be easily constructed in a software simulator to replicate two crucial features of the human brain in terms of its high parallel information processing capabilities. The first attribute shows a capacity to learn from examples. The second characteristic is the capacity to generalize the knowledge acquired throughout the learning process to new datasets and anticipated datasets [2]. Fire alarm systems are now an essential part of all construction types due to the rapid increase in the frequency of fire incidents. Fire outbreaks have been listed as one of the disasters that we encounter more frequently when we think about disasters. Numerous techniques for early fire detection have been proposed and put into practice to reduce such accidents. Most of the techniques have thus far produced the desired results. However, because early fire detection is ineffective at preventing the activation of false alarm systems, it does not seem to be a promising solution. Current fire detection technologies rely on physical sensors like heat detectors, smoke detectors, and flame detectors. The reliability of the results produced by these sensor-based detection systems is questionable [7]. The advantages that existed with physical sensor-based systems in the past have been minimized by major highlighted areas in artificial intelligence, such as vision-based study disciplines like Image Processing and Computer Vision, which have produced distinct results. Since neural-based fire detection has

outperformed physical sensor-based systems in terms of cost, accuracy, robustness, and reliability, it has become the preferred method over those systems. A new model can be put into practice, taking robustness and reliability measures into consideration, with such advancements in technology and a great vision for neural-based fire detection techniques. We have cited a model that combines the strengths of the existing fire-based detection system and the neural-based fire detection approach, resulting in more accurate results while also reducing the common false triggering in the physical sensor-based system. The contribution of this study is discussed as follows:








We have introduced a model that seems more promising with the blended approach, as mentioned above. This model, which runs on the Arduino Node MCU and uses IoT for real-time fire detection, has the best fire detection performance while maintaining a respectable frame rate.

We used the aforementioned incorporation to create our neural network model, which we assessed and trained using data from the integrated fire sensor system. The model is tested on our machine-generated dataset with different optimizers.

The following is a breakdown of the paper's structure: The second part delves into previous research in sensor-based fire detection, machine learning, and artificial neural networks. Part 3 describes the strategy and in part 4 illustrates the observations of various optimizers along with the findings. Finally, in section 5,

Research Article

Evaluation of Single-Shade Composite Resin Color Matching on Extracted Human Teeth

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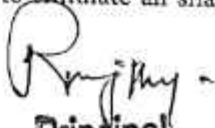
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Introduction. Universal single-shade composite resins are characterized by a property that enables the creation of restorations that mimic tooth structure to the extent possible with fewer shades of color. **Objectives.** This study aimed to instrumentally and visually evaluate the color correspondence of two single-shade composite resins in extracted human teeth multishade composite resins. **Methods.** Upper central incisors and upper and/or lower molars with intact buccal surfaces were selected. The study consisted of a control group ($n=20$): Z250 XT (3M ESPE) (G1) multishade composite resin in colors A1 to A4, and a test group ($n=20$) divided further into two equal groups, consisting of single-shade composite resin Omnicroma (Tokuyama Dental) (G2) and single-shade composite resin Vittra APS Unique from (PGM) (G3). Instrumental evaluation was performed using a spectrophotometer, and visual evaluation was performed by three observers. Descriptive measurements related to the differences in color obtained through instrumental means were analyzed using mean and standard deviation, wherein the means were compared using ANOVA, applying the Bonferroni post hoc test. **Results.** A statistically significant difference was observed among the groups (G1, G2, and G3) (ANOVA: $p < 0.001$). For the visual assessment, regardless of the assessment group, 77.49% of the teeth were within the acceptable color-match classification, with the single-shade resins showing better correspondence than the multishade resins. **Conclusion.** Single-shade composite resins showed different color-matching results when compared to multishade resins, both in spectrophotometry and visual evaluations. **Clinical Significance.** Single-shade composite resins simplify the shade-selection process and are promising materials for use in dental practice.

1. Introduction

For a restoration to be esthetically acceptable, the color of the composite resin and natural tooth structure must be so similar that the human eye cannot detect the difference between the two [1]. Layering techniques have been recommended for composite resin restorations. Although this technique is a very effective method for color matching, it requires considerable professional skill and more clinical time to perform [2]. Therefore, the emergence of new techniques is expected to facilitate clinical protocols, reduce clinical time, and facilitate the color selection process in dentistry, which is challenging.

Based on this color combination concept, single-shade composite resins have recently been introduced to the market. These materials are produced to perfectly match the surrounding tooth color, regardless of the color of the tooth to be restored [3]. These resins exhibit a phenomenon called the “chameleon effect” or “mixing effect,” which refers to the ability of a material to combine and acquire a color similar to that of its surrounding structures [4]. This means that two colors, when seen side by side, will mix under the right conditions so that the perceived color of a region changes to that of the surrounding area [5]. These composite resins have the advantage of being able to simulate all shades of tooth


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Review

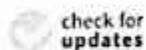
Anti-Cancer Agent: The Labdane Diterpenoid-Andrographolide

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Abstract: In spite of the progress in treatment strategies, cancer remains a major cause of death worldwide. Therefore, the main challenge should be the early diagnosis of cancer and the design of an optimal therapeutic strategy to increase the patient's life expectancy as well as the continuation of the search for increasingly active and selective molecules for the treatment of different forms of cancer. In the recent decades, research in the field of natural compounds has increasingly shifted towards advanced and molecular level understandings, thus leading to the development of potent anti-cancer agents. Among them is the diterpene lactone andrographolide, isolated from *Andrographis paniculata* (Burm.f.) Wall. ex Nees that showed shows a plethora of biological activities, including not only anti-cancer activity, but also anti-inflammatory, anti-viral, anti-bacterial, neuroprotective, hepatoprotective, hypoglycemic, and immunomodulatory properties. Andrographolide has been shown to act as an anti-tumor drug by affecting specific molecular targets that play a part in the development and progression of several cancer types including breast, lung, colon, renal, and cervical cancer, as well as leukemia and hepatocarcinoma. This review comprehensively and systematically summarized the current research on the potential anti-cancer properties of andrographolide highlighting its mechanisms of action, pharmacokinetics, and potential side effects and discussing the future perspectives, challenges, and limitations of use.

Keywords: cancer; mechanism of action; apoptosis; autophagy; angiogenesis; enhanced radio-sensitivity



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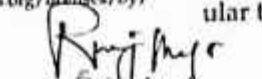



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1. Introduction

In spite of the progress of treatment strategies, cancer remains a major cause of death worldwide [1]. The conventional cancer treatments include chemotherapy, radiotherapy, and surgical removal. However, in some cases the resistance of cells to these therapies reduces their effectiveness. The incidence of cancer and the mortality rate have risen exponentially, with about 19.3 million new cancer cases in 2020 [2]. Despite the advances of cancer treatments, that include surgery, conventional chemotherapy, radiation therapy, hormone therapy, and immunotherapy, the overall disease-free survival rate is still inadequate. Additionally, the toxicity often associated with anti-cancer drug therapy poses additional challenges. Therefore, the search for non-toxic alternative therapies, including the use of non-toxic natural compounds of plant origin, for the prevention and treatment of cancer is drawing increasing attention. Due to their availability and wide margin of safety, plant-derived products have made a great impact on drug discovery and are gaining increasing attention for both cancer prevention and treatment [1,3].

Generally, natural compounds display multi-targeted effects, affecting various molecular targets including cytokines, transcription factors, growth-factor receptors, adhesion


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AN EXTENSIVE REVIEW ON MEDICINAL PLANTS IN THE SPECIAL CONTEXT OF ECONOMIC IMPORTANCE

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ABSTRACT

Our health-care system would be incomplete without the use of medicinal herbs. In the days before modern medicine, several communities created medical knowledge systems known as "traditional medicine," "indigenous medicine," or "folk medicine." The medicinal properties of plants and plant-based products are widely accepted. There are a variety of medical approaches available across the world, including allopathic, homeopathic, Ayurvedic, and Chinese. The developed communities each have their own *Materia Medica*, which compiles thorough data on many plants used as medicines. According to current estimations from the field of botany, there are somewhere between 2,50,000 and 3,50,000 distinct plant species in existence. It is estimated that 35,000 unique species are used to cure a wide range of ailments in diverse places throughout the world. Based on general popularity among all ages, phytopharmaceuticals are an integral part of worldwide business and the global economy. According to a globe news wire study, the global herbal medicine market is estimated to be 550 billion dollars by 2030, up from 83 billion dollars in 2019. China and India lead the global herb market. China exports 120,000 tonnes of herbal remedies annually, followed by India with 32,000 tonnes. Europe is the world's largest importer of medicinal plants (MP), taking in over 400,000 tonnes annually to fulfill local demand. In this review, we have discussed about the MP and their economic importance in global market.

Keywords: Medicinal plants, Economic importance of medicinal plants, World economic market of traditional medicine, Import export of traditional medicine, Medicinal plants and human health.

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INTRODUCTION

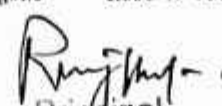
Plants have an essential part in the health of the vast majority of people worldwide. Approximately 2 million traditional health practitioners in India employ medicinal plants (MP) to treat a variety of diseases [1-4]. The use of therapeutic plants dates back to the beginning of human history [5-7]. In the form of traditional and folkloric medicine, the history of a plant is based on the extensive experiences of a large number of different healers, which may have been passed down from ancestors or evolved via the author's own experiences over the course of time [8]. Importantly, the profound knowledge contained in this natural medicinal resource has not been tainted by any recent cultural upheavals. Therefore, none of the two existing methods of therapy can normally stake a claim to having invented it. Examples of well-developed systems of treatment include traditional techniques of therapy such as the Ayurvedic, homeopathic, and allopathic systems of medicine [9-12]. These methods of treatment differ from one another in both ideas and processes. *Materia Medica* is a compendium of extensive information on a range of plants that are used for medicinal reasons in more developed countries [13]. When this natural human pharmacy is combined with the incredible progress being made in other fields of medical research today, it surely provides the framework for a revolution in the traditional health-care system that is much needed.


Botanical research estimates that there are between 2,50,000 and 3,50,000 different plant species on the world. On the other hand, it is only stated that 35,000 distinct species are employed for the treatment of a variety of illnesses in various regions of the world [14]. Because these plants are utilized almost exclusively in their unprocessed or semi-processed forms, and because they are frequently combined, quality control testing and stringent clinical studies are required for scientific justification [15,16]. According to the findings of a study [16-18], researchers estimated that only around 15% of MP had undergone

phytochemical analysis, while only about 6% had undergone biological screening. The remainder of the plants was left alone, which means that this treatment method has a huge amount of potential when it comes to the development of new and more efficient medicinal agents.

On the basis of widespread approval among people of all ages, phytopharmaceuticals are depicted as an essential component of international commerce and the global economy [19]. It was projected that the overall worldwide herbal industry for medications derived from plants was worth 18 billion dollars in 2005, in 2019 it increase to 83 billion dollar and according to the globe news wire report, it is expected the global herbal medicine market will be 550 billion dollar by 2030 [20,21]. It should come as no surprise that China and India dominate the worldwide market for the trading of herbs. It is projected that China exports more than 120,000 tonnes of herbal medications each year, followed by India with an export volume of roughly 32,000 tonnes. Europe, on the other hand, is the world's largest importer of MP, bringing in roughly 400,000 tonnes each year from a range of European nations to meet local demand for herbal remedies [22,23].

The high trust that the English population has in natural medicines was reflected in a report that was presented to the British parliament. In 2002, residents of the United Kingdom visited the clinics of 50,000 herbal practitioners, spending a total of 126 million pounds [24]. There has been a noticeable shift toward the increased use of herbal goods in the United States [22], and the overall market for herbal products is 230 billion dollar in 2021 and was projected to be worth 430 billion dollar in 2028. Over the course of recent history in the United States of America, there has been a discernible rise in the use of various herbal cures. Countries in Europe have reported experiencing the similar pattern of events. It is projected that over-the-counter (OTC) sales of herbal remedies have generated close to 73.4 billion dollars in revenue in 2020 (Fortune Business


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Designing $\text{Cu}_2\text{V}_2\text{O}_7/\text{CoFe}_2\text{O}_4/\text{g-C}_3\text{N}_4$ ternary nanocomposite: A high performance magnetically recyclable photocatalyst in the reduction of 4-nitrophenol to 4-aminophenol

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Spectroscopy

ABSTRACT

A simple, cost-effective design was adopted to construct a ternary $\text{Cu}_2\text{V}_2\text{O}_7/\text{CoFe}_2\text{O}_4/\text{g-C}_3\text{N}_4$ nanocomposite using the hydrothermal route. Its use as an efficient magnetically recyclable photocatalyst was evaluated in the photo-reduction of 4-nitrophenol (4-NP) to 4-aminophenol (4-AP) using sodium borohydride (NaBH_4) under visible light. The as-synthesized nanocomposite was characterized using powder XRD, FT-IR, SEM, HRTEM, TEM, XPS, UV-Vis DRS, and PL studies. $\text{Cu}_2\text{V}_2\text{O}_7/\text{CoFe}_2\text{O}_4/\text{g-C}_3\text{N}_4$ nanocomposite showed sterling catalytic performance in the present photo-reduction reaction. This reaction got completed in just 60 s at room temperature. Successive cycles showed excellent catalyst recyclability and stability for ten runs without any considerable loss in its activity. The presence of $\text{g-C}_3\text{N}_4$ in the synthesized nanocomposite helps in facilitating easy electron transfer and efficient adsorption of substrates onto it. Thus the synergism operating between the various components in the $\text{Cu}_2\text{V}_2\text{O}_7/\text{CoFe}_2\text{O}_4/\text{g-C}_3\text{N}_4$ nanocomposite in combination with its visible light-responsive character account for its superlative photocatalytic behaviour in the reduction of 4-NP.

1. Introduction

With the advent of industrialization, there has recently been a dismaying increase in the release of hazardous chemicals directly into the atmosphere [1]. Nitro compounds especially nitroarenes are distinctively dangerous towards the environment and human race. These compounds are toxic and carcinogenic and can simply invade humans through all routes such as inhalation, ingestion, and absorption through the skin. Amongst these, Nitrophenols behave as major pollutants existing within the industrial and agricultural wastewaters due to their solubility and stability in water [2]. Regrettably, 4-NP is the most common organic pollutant targeting both humans and animals causing multiple diseases [3]. Thus it becomes increasingly crucial to devise thoroughly clean and eco-friendly processes for their removal from the environment. Consequently, the breakdown of 4-NP into small non-toxic molecules has become a top-notch research area in recent times. Degradation of 4-NP, being a difficult task, its catalytic reduction to 4-AP can be reviewed as a standout amongst the most exceedingly used remediation technique for removal of 4-NP [3,4]. Not only 4-AP is less toxic than 4-NP, but it has great relevance in laboratories and chemical industries owing to their

versatility in many bioactive natural products, dyes, pigments, herbicides, pharmaceuticals, etc [5].

Designing eco-friendly photocatalysts for environmental redress has recently attracted the serious attention of the scientific community and pathbreaking achievements have also been witnessed [6–8]. Graphitic carbon nitride ($\text{g-C}_3\text{N}_4$) is a fascinating semiconductor photocatalyst consisting of tri-s-triazine units. It has significant advantages over traditional catalysts due to its low-cost precursors, non-toxic nature, high thermal and chemical stability, special optical structure, etc. Thus, $\text{g-C}_3\text{N}_4$ is frequently used in different reactions like oxidation-reduction, water splitting, photodegradation of organic contaminants, condensation reactions, heterogeneous catalysis, etc [6–11]. However, photocatalytic efficiency of $\text{g-C}_3\text{N}_4$ also faces serious challenges due to the high recombination rate of the photochemically generated electron-hole pairs, low surface area, and low conductivity. The swift recombination of photoexcited electron-hole pairs is observed as a significant problem in retarding the photocatalytic performance of single component semiconductors. Therefore, modifying $\text{g-C}_3\text{N}_4$ photocatalysts with other semiconductors increases its absorption range and also results in heterojunction formation between the different semiconducting materials.

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Fabrication of hierarchical Bentonite/Chitosan/NiFe₂O₄ ternary nanocomposite and its efficiency in the removal of Pb(II) from aqueous medium

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ABSTRACT

Lead is the most globally bountiful harmful substantial component in nature. Its utilization can be followed to verifiable occasions. The current work includes the combination, portrayal, and utilization of bentonite/chitosan/NiFe₂O₄ ternary novel nanocomposite. Nanostructured nickel ferrite was joined with chitosan and bentonite to frame a novel ternary nanocomposite. The nanocomposite was portrayed by FT-IR, powder XRD, VSM, and TEM investigation. All the logical outcomes affirm the fruitful arrangement of ternary composite. The as-blended nanomaterial was applied as nanoadsorbent for the evacuation of lead (II) from water. The ideal composite portion was 50 mg/100 mL was seen as profoundly powerful for the evacuation of 62% Pb (II) particles from 200 ppm watery arrangement. This ferromagnetic, minimal effort, the eco-accommodating nanocomposite may end up being helpful for the expulsion of lead from watery arrangement at the mechanical level.

Keywords: Ferromagnetic, Nanocomposite, NiFe₂O₄, Pb (II), Ternary

1. Introduction

Lead is the most all inclusive bountiful poisonous overwhelming component in the earth and is scattered in the various segments of nature. The sulling of lead with the earth is because of certain modern exercises like creation of the lead stockpiling cell, lead pipes, paints, clinical hardware, and distinctive rural practices. The poisonous impact of lead is because of its mediation with the biomolecules present in the living framework [1]. 10 mcg/dL (microgram per deciliter) is the lenient furthest reaches of lead in the living framework. Pb (II) particles can enter the living framework either through defiled water or air. When lead interacts with blood, it ties with the sulfur-containing protein and dispersed to the various tissues of the body. Lead is known to harm the kidney, liver, regenerative framework, mind work, and so on [2]. Sulling of lead in the drinking water is basically because of filtering of the metal, which may present genuine well-being perils [3]. Different

treatment procedures such as ion exchange, electrolyte removal, membrane filtration, reverse osmosis, solvent extraction and adsorption have been reported for effective removal of lead from water [4-7]. However adsorption technique is found to be the most successful and cost effective method for the removal of lead from water. Various materials either normally accessible or synthetically structured have been accounted for as adsorbents of lead from water. Be that as it may, the proficiency of such adsorbents in lead expulsion isn't up to the level [8]. Hence the requirement for more current progressively productive adsorbents for Pb(II) particles is viewed as a difficult task. As the procedure of adsorption is a surface marvel and henceforth it is expected that nanocomposite will be the best substitute and fruitful adsorbent for the expulsion of lead from water. As of late, the chance of getting ready metal ferrites based nanocomposites has opened another and energizing exploration field with progressive application in the field of water treatment [9] because of their nanometer size, superparamagnetic properties,



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Vibrational spectra of NCCN, CNCN and CNNC : a study using the U(4) algebraic model

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ABSTRACT

A detailed study on the vibrational spectra of cyanogen(NCCN) and its isomers – isocyanogen(CNCN) and di-isocyanogen(CNNC) has been reported in this work using the U(4) algebraic model. With detailed spectral analysis, it has been shown in this study that NCCN, CNCN, CNNC and all their isotopic species can be approximated well using the U(4) algebraic model.

1. Introduction

In the study of vibrational spectra of a large (larger than diatomic) molecule, in many aspects, the U(4) and U(2) algebraic models [1,2] are in advantageous positions [3,4] with respect to their traditional counterparts. However, it is to be noted that simply to provide a global vibrational picture of a certain molecule, the rotational degrees of freedom are completely disregarded in the U(2) algebraic model. Such a drawback is overcome with the introduction of the U(4) algebraic model. The full treatment of molecular rovibrational degrees of freedom can be achieved in the three-dimensional framework of the U(4) algebraic model [5]. The three dimensional framework of the U(4) algebraic model leads us to a more complex and realistic picture of a molecular system as well as producing a more exacting algebraic treatment. The three-dimensional algebraic model is definitely much more difficult to manipulate than the one-dimensional one, purely for algebraic aspects. Due to this reason, the U(4) algebraic model could proceed till today only up to the approximation of tetratomic molecules [6–8].

Since long back, there has been a constant interest in the investigation regarding the presence of carbon containing molecules in various parts of the universe. As an invaluable tool, vibrational spectroscopy plays an important role in this mission. Huge number of scientists around the globe have been working here in the investigation to work out the origin of life. The mission also have been working in order to search the answers of so many vital questions in connection with the probability and possibility for the existence and creation of life at other parts of the Universe. It is claimed that the chemistry of life may have begun shortly after the Big Bang – nearly 13.8 billion years ago, during a habitable epoch when the Universe was only 10–17 million years old [9]. The first carbon-containing molecule detected in the interstellar

medium was the methylidyne radical(CH) in 1937 [12]. Since 1970s, it has been evident that interstellar dust consisted of a large component of more complex organic molecules [13], probably polymers having the composition based on formaldehyde(H₂CO) [14]. Later, the existence of polycyclic aromatic hydrocarbon molecules were successfully demonstrated in space [15]. During 2004, the spectral signatures of anthracene and pyrene were detected [16] in the ultraviolet light emitted by the Red Rectangle nebula (no other such complex molecules had ever been found before in outer

space). The scientists inferred that since they discovered polycyclic aromatic hydrocarbons(PAHs) – which may have been vital in the formation of early life on earth – in a nebula, by necessity they must originate in nebulae [17]. In 2010, fullerenes (“buckyballs”) were detected in nebulae [18]. Fullerenes have been implicated in the origin of life. It was also claimed that buckyballs from outer space provided seeds for life on earth [19]. A series of rigorous studies on the vibrational spectra of Fullerenes already have been reported by the author along with his co-workers [20–22]. During 2011, by using spectroscopy it was reported that cosmic dust contains complex organic compounds that could be created naturally and rapidly by stars [26]. Chemical structures of these compounds resemble the makeup of coal and petroleum and such chemical complexity was previously thought to arise only from living organisms [27]. These observations suggest that organic compounds introduced on Earth by interstellar dust particles could serve as basic ingredients for life due to their surface-catalytic activities [28]. In 2012, astronomers at Copenhagen University, reported the detection of a specific sugar molecule, glycolaldehyde in a distant star system, located 400 light years from Earth [29]. Glycolaldehyde is needed to form ribonucleic acid(RNA). This finding suggests that complex organic molecules may form in stellar systems prior to the formation of planets, eventually arriving on young planets early in their

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Probiotic and Cytotoxic Potential of Vaginal *Lactobacillus* Isolated from Healthy Northeast Indian Women

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Abstract

The vaginal microbial composition of wellbeing women were predominated by *Lactobacillus* group which play prime character in health-promoting activities including the prevention of the colonization of pathogenic microbe. The present study focused to characterize the probiotic and cytotoxicity potential of the *Lactobacillus* strains collected from the vaginal environment of the healthy women. *Lactobacillus* strains were identified via biochemical characterization and 16SrRNA gene sequencing. Strains were also evaluated for their probiotic potentials that includes antibiotics sensitivity; survivability to gastrointestinal conditions; antibacterial activities, biofilm production, auto aggregation and adhesion abilities to hydrocarbon. Cytotoxic activities were assessed through 3-[4,5-dimethylthiazole-2-yl]-2,5-diphenyltetrazolium bromide (MTT) assay using HeLa (cervical), AGS (gastric cancer) and A549 (lung cancer) cell lines. Results identified five bacterial strains viz., (*Lactobacillus mucosae* K76, *L. fermentum* K81, *L. fermentum* K85, *L. reuteri* K97 and *L. reuteri* K99) contains high probiotic potential and three strains with high cytotoxic activities against cancer cell lines can be further explores for the human beneficial activities. Finding from this study also indicates that vaginal environment represents a novel source of probiotic candidates.

Keywords: Microbial diversity, bacterial vaginosis, antimicrobial activity


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Eugenol and capsaicin exhibit anti-metastatic activity *via* modulating TGF- β signaling in gastric carcinoma†

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The transforming growth factor- β (TGF- β) signaling is considered to be a key player in gastric cancer metastasis, and the inhibition of the TGF- β /SMAD4 signaling pathway may be a novel strategy for therapeutic interventions in cancer. Here, the anti-metastatic activity of two phytochemicals, eugenol and capsaicin, has been studied, and their potential to antagonize TGF- β has been investigated in gastric cancer cells. Both the phytochemicals exhibited anti-metastatic activity by inhibiting the TGF- β signaling pathway independent of P21 or P53, with capsaicin proving to be more potent than eugenol. However, unlike eugenol, the inhibitory effect of capsaicin on the TGF- β signaling pathway and metastasis was found to be dependent on SMAD4, which was validated in SMAD4-knocked down AGS cell and SMAD4-null SW620 cell line. Furthermore, the use of recombinant TGF- β and TGF- β receptor inhibitor LY2109761 confirmed that the anti-metastatic activity of eugenol is partially and that of capsaicin is principally mediated through the TGF- β signaling pathway. Identifying phytochemicals with the potential to inhibit cancer metastasis by targeting the TGF- β signaling pathway has immense scope for developing a therapeutic strategy against cancer metastasis.

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1. Introduction

According to GLOBOCAN 2018, gastric cancer is the 5th most frequent cancer and the 3rd leading cause of cancer deaths, following lung and colorectal cancers. The prognosis of gastric cancer patients is poor because of distant metastasis and tumor relapse.¹ Recent reports indicate that the elevated Transforming Growth Factor- β (TGF- β) levels in the serum of gastric cancer patients is correlated with lymph node metastasis and poor prognosis.^{2,3} High TGF- β has also been shown in gastric mucosa⁴ as well as in the stromal cells,⁵ which resulted in worse clinical outcomes. Therefore, targeting TGF- β signaling may be an effective therapeutic strategy to arrest gastric cancer metastasis.

Recent reports suggest that TGF- β induces gastric cancer metastasis by triggering c-Jun N-terminal kinase (JNK) and

extracellular signal-related kinase (ERK)-mediated fascin1 expression.⁶ In the canonical TGF- β signaling pathway, TGF- β binding with receptors induces SMAD2/3 phosphorylation and promotes SMAD2/3-SMAD4 translocation to the nucleus.^{7,8} Another study reveals that excessive expression of TGF- β activates SMAD4, leading to the upregulation of downstream metastasis-associated genes. Thus, the inhibition of the TGF- β /SMAD4 signaling pathway may be a novel strategy for cancer treatment.⁹

Several anti-TGF- β approaches such as anti-TGF- β antibodies, antisense oligonucleotides and TGF- β receptor inhibitors hold great promise in preclinical studies.^{8,10} However, according to a few reports, long-term use of TGF- β inhibitors makes cancer cells unresponsive towards radiation treatment.¹¹ Therefore, identification of novel, more effective inhibitors of TGF- β signaling pathway is a promising area of cancer research.

In the past few decades, it has been established that to withstand invasion and metastasis, natural compounds are the drug of choice due to their less toxicity.¹² Eugenol (4-allyl,2-methoxyphenol), the active principle of clove, and capsaicin (8-methyl-N-vanillyl-trans-6-nonenamide) found naturally in hot chill peppers have been reported to induce apoptosis, and inhibit invasion and metastasis,^{12,14} but the underlying molecular mechanism has not been established yet.

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