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Antimicrobial activity of *Tectona grandis* against MDR enteric pathogens

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Abstract

India is a rich source of medicinal plants and plant kingdom is valuable source of many new medicines which act as a natural remedies for certain diseases. In this study, an attempt had made to find out the antimicrobial activity of *Tectona grandis* leaves (pure and hybrid variety) against enteric bacterial pathogens. Plant extract was prepared using Chloroform and suspended in DMSO solution. Comparative study of leaf extract (Pure and hybrid) were evaluated by disc diffusion method against different pathogenic bacteria viz. *Staphylococcus aureus*, *Bacillus cereus*, *Salmonella typhi* and *Escherichia coli*. The result obtained revealed that plant showed maximum inhibition against gram positive bacteria rather than gram negative bacteria. Comparatively it was also observed that hybrid variety of *Tectona grandis* showed more antimicrobial activity than the pure variety. This study concludes that the phytochemicals obtained from *Tectona grandis* can be used in several gastrointestinal ailment and can be commercialised.

Keywords: Antimicrobial activity, solvent extraction, *Tectona grandis*, gastrointestinal pathogens

Introduction

Tectona grandis Linn., commonly known as teak tree or sagwan (Hindi) is known in the world for its stability, extreme durability and hardness in timber production. It belongs to the family Verbenaceae. The other two species, *Tectona hamiltoniana* and *Tectona philippinensis*, are found in particular areas with small native distribution in Myanmar and the Philippines respectively. *Tectona grandis* is an excellent timber therefore it is used for boat ship building, bridge building and many other construction purpose, decoration, furniture, cabinets, musical instruments, handicrafts. *Tectona grandis* wood is found useful in the treatment of many disease like constipation, biliousness, hyperacidity, leprosy, headache, burning sensation, worms, cough, piles, microbial, fungal, dysentery infection, liver related problems and leukoderma. *Tectona grandis* leaf extract are used for the treatment of various kind of wounds, burning sensation, and pain. The oil obtained from the flower and nuts promotes hair growth and useful in the treatment of scabies while roots are used in the treatment of urinary related problems (Aboaba *et al.* 2013) [1]. *Tectona grandis* is a tropical hardwood trees and placed under the flowering plant. It is a large deciduous tree that occurs in mixed hardwood forest. Teak is one of the most valuable tree of the tropics and is extensively used for the various purposes, owing to its timber qualities it is so valuable. It is resistance towards termites, resistance towards fungi, resistance towards weather and having non-corrosive properties. (Kaosa-ard, 1986) [8]. *Tectona grandis* is large tree reaching up to 30m height under favourable condition. Having crown which open with many small branches up to 15m long. Stem is cylindrical and strength at the base. Bark is light brown, fibrous shallow or longitudinal crevice. The root system is superficial, having depth not more than 50cm, but may extend up to 15m laterally from the shoot. The leaves are shiny from the above and hairy from the lower, showing clearly vein network. The leaves are opposite, elliptic or ovate, entire, acute. Young leaves are up to 1m long. Flowers are small, white and arranged in large, flowering heads, found on the topmost branches in the unshaded part of the crown. Fruits is drupe having 4 chambers which are round, hard and woody, pale green when young and become brown at maturity. (Nidavani and Mahalakshmi 2014) [9]. Traditionally, *Tectona grandis* used globally for the treatment of various disease but Bitchoga *et al.* (2015) studied the use of *Tectona grandis* in the Northern region of Cameroon, the leaves obtained from teak are used for their laxative properties while in the Western region, leaves are used for the treatment of skin diseases. Phytochemical investigation of the teak led to the isolation of the triterpenoids, flavonoids (Ragasa *et al.* 2007) [10], chromomoric acid derivatives, anthroquinones-naphthoquinones (Aguinalda *et al.* 1997), apocarotenoids and lignans (Lacret *et al.* 2012) [12].

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Review Article

CHROMOSOMAL VARIATIONS AND SPECIATION IN INDIAN SPECIES OF GENUS *SENNA* MILL. (SUBTRIBE CASSIINAE, FABACEAE): A SYNOPTICAL REVIEW

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Senna, *Cassiinae*, Polyploidy, Disploidy, Speciation

ABSTRACT

Senna Mill, a widely distributed leguminous genus with about 350 species of herbs, shrubs and tree belongs to sub-tribe *Cassiinae* showing great variations in habit, morphology and chromosome number. In India genus is represented by about 43 species showing characteristic variations in diploid chromosome number ($2n = 24, 26, 28, 56$ and 102) as well as in haploid chromosome complements ($n = 12, 13, 14$ and 28) with prevalence of $2n = 28$ in different species. The genus exhibit the basic chromosome number $x = 7$ as well as secondary basic number of $x = 13$, and 14 . The secondary basic numbers have been evolved from the primary number by initial polyploidization followed by aneuploid and disloid modification of the secondary basic number during the course of diversification and evolution. Two closely related species viz, *Senna obtusifolia* with $2n = 28$ and *Senna tora* with $2n = 26$ exhibit the best example of these type cytogenetical modification. Both the species resemble so closely to each other in their external morphology to the extent that they have been recognized conspecific by majority of taxonomist but they can be differentiated by holistic approach using various morphological and molecular markers. Present finding based on the review of the chromosome number of Indian species reveal that *Senna tora* ($2n = 26$) have been evolved from the widely distributed *Senna obtusifolia* ($2n = 28$) through aneuploid and prevalently by disloid modification of the chromosome during gamete formation. Thus initial polyploidization and subsequent aneuploidy and disploidy had played very important role in speciation of Indian species of *Senna* Mill.

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INTRODUCTION

Senna Mill. a leguminous genus, previously recognized as subgenera under genus *Cassia* L. *sens. lat.* has been elevated to the level of genera under sub-tribe *Cassiinae*, tribe *Cassieae*, sub-family *Caesalpinioideae* of family *Fabaceae*. Irwin and Barneby (1981, 82) after establishing the sub-tribe *Cassiinae* have segregated it into three genera viz, *Cassia* L. *sens. str.*, *Chamaecrista* Moench. and *Senna* Mill. This concept of trifurcation have been well recognized in the recent years (Randell, 1988; 1989; 1990; Larsen and Hou, 1996; Acharya *et al.*, 2011). *Senna* Mill. is one of the most widely recognized genus under family *Fabaceae*, comprising of approximately 350 species of herbs, shrubs and trees distributed throughout American, African, Asian and Australian continents (Rendell and Barlaw, 1998; Marazzi *et al.*, 2006). In India 43 species of *Senna* have been reported of which 28 species including 5 endemic are endogenous and other species have been reported in cultivation (Singh 2001). Out of above 43 species 13 species including 5 endemic are of Asian, 18 of American, 6 of African and 6 are of Australian origin (Singh, 2001). Genus *Senna* have

been delimited into six sections (Irwin and Barneby, 1982) and those related to Indian species have been placed under sections *Psilorhegma*, *Peiranisia*, *Chaemaefistula*, and *Senna* (Singh, 2001). Phylogenetic analysis based on molecular markers reveal that *Senna* is a monophyletic genus consisting of polyphyletic sections except section *Psilorhegma* (Marazzi *et al.*, 2006; Acharya and Panda, 2010). Different species under genus exhibit difficult taxonomic interpretations particularly in floral features. Genus exhibits characteristic type of buzz pollination, heteranthery, poricidal anther dehiscence mechanism, enantiostylous carpel (Dulberger, 1981; Gottsberger and Gottsberger, 1988; Mishra *et al.*, 2014). Many *Senna* species also bears extrafloral nectary or gland on foliage that attract ants that feed on it laid to the establishment of opportunistic mutualism protecting the plant from herbivores enable its diversification (Heil and Mckey, 2003).

In spite of its wide distribution, the existing literatures reveal that the chromosomal records are available merely for about one fourth species under genus *Senna*. Though there is record of existence of diploid chromosome number of $2n = 22, 24, 26,$

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Determination and comparison of antimicrobial activity of *Psidium guajava* and *Emblca officinalis* against MDR bacteria

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Abstract

The antimicrobial activities of *Psidium guajava* (guava) and *Emblca officinalis* (amla) were determined and compared against 2 gram +ve (*Staphylococcus aureus* and *Bacillus cereus*) and 2 gram -ve bacteria (*Salmonella typhi* and *Escherichia coli*), which are Multi Drug Resistant (MDR). The guava and amla leaves were crushed and their extract was taken in methanol and ethanol respectively. The efficiency of these extracts were tested against MDR bacteria through well diffusion assay. In this study both extract showed inhibitory activity against MDR bacteria. The methanol extract of guava showed maximum antimicrobial activity against *B. cereus* (gram +ve) followed by *S. aureus* (gram +ve) while lesser inhibition against *S. typhi* (gram -ve) and least inhibition against *E. coli* (gram -ve) was observed. The ethanol extract of amla showed maximum inhibition against *Salmonella typhi* (gram -ve) while minimum against *Staphylococcus aureus* (gram +ve). On the basis of present findings it was concluded that both the extracts possesses antimicrobial and pharmacological properties, hence can be used parallel to synthetic drugs which have undesirable side effects.

Keywords: *Psidium guajava*, *Emblca officinalis*, methanol and ethanol extract, antimicrobial activity MDR pathogens

Introduction

Although this era witnesses amazing success in the development of technology, science, medicine and the discovery of antibiotics and making use of them as chemotherapeutic agents. This has made the medical fraternity to believe that they will eradicate various infectious diseases but to some extent we failed to control the dramatic spread of infectious diseases. As per the WHO reports, more than 80 % of the world's population relies on traditional medicine for their primary healthcare needs. The struggle between man and microbes began since their appearance on earth. After the development of first antibiotic 'Penicillin' by Alexander Fleming (1929) interest in this magic drug antibiotics increased, leading to new waves of synthetic antibiotics. Antibiotics are chemical substances produced from various microorganisms (bacteria, virus, fungi) that kill or suppress the growth of microorganisms. The misuse of antibiotics by humans, the employment of antibiotics in veterinary practices and the growing presence of antibiotics in water, soil, food contribute to the problem of antibiotic resistance, leading to prevalence of MDR infections. Hence the emergence of MDR strains of different groups of microorganisms has become a major cause of failure of the treatment of infectious diseases. To this emerging problem of antibiotic resistance, phytochemicals obtained from medicinal plants may be one of the remedy of this problem. This further drives the need to screen medicinal plants for novel bioactive compounds as plant based drugs are biodegradable, safe and almost t no side effects (Ramya *et al*, 2008) [9]. The green medicines are widely believed as safe in contrast with expensive synthetic drugs (antibiotics) that have undesirable side effects along with beneficial effects (Alviano *et al.*, 2009). In the past few decades, the curiosity to evaluate plants possessing antimicrobial, antifungal, anti-inflammatory activity for various diseases has grown manifold and a large number of biologically active compounds have been characterized. The WHO is promoting and facilitating the effective use of herbal medicine for the health program of developing countries. Plants are the largest biochemical and pharmaceutical stores on our planet. These living stores are able to generate endless biochemical components. Medicinal plants are very rich in many variety of secondary metabolites of antimicrobial properties such as saponins, tannins, alkaloids, alkenyl phenols, glycoalkaloids, etc. The present study was undertaken to evaluate and compare the antimicrobial activity of methanolic extract of guava leaves and ethanolic extract of amla leaves on 4 MDR bacteria namely, *Salmonella typhi*, *Staphylococcus aureus*, *Bacillus cereus* and *Escherichia coli*. *Psidium guajava* (guava) belonging to family myrtaceae

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Diversity and Conservation Strategies of Pharmaceutically important Medicinal plants of Bundelkhand region, India

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ABSTRACT

Bundelkhand is located Central part of India with an unique type of climatic condition having stony sandy and rocky soil deficient in water. Gradual climatic change due to acute pressure on land for various developmental activities are regularly increasing the degradation of biodiversity which is affecting the potential of medicinal plants and invite needs for the conservation of biodiversity of medicinal plants in the region. During the course of various studies authors have identified the medicinal plants of high value, used in top medical prescriptions and traditional medical practices viz. *Acacia catechu* (Khadira), *Asparagus racemosus* (Shatawari), *Boswellia serrata* (Shalaki), *Desmodium gangeticum* (Shalaparni), *Gymnema sylvestre*.(Retz.) R. Br. ex Sm.(Gudmaar), *Hemidesmus indicus* R.Br.(Anantmoola), *Oroxylum indicum* (L.) Kurz, *Pluchia lanceolata* (Rasana), *Tribulus terrestris* (Gokshuru), *Uraria picta* (Prishniparni), *Withania somnifera* (Ashwagandha), *Writia tinctoria* etc. Efforts are needed in acclimatizing the medicinal plants in the garden land, nurseries, development of strategy of protection of natural habitat of the medicinal plants of region, developing agro-technical protocols for cultivation of medicinal plants suitable for farmers to enrich their economy as well as biodiversity under Government control is need of the day ensuring effective conservation of these valuable medicinal resources of the country. Cultivation of *Cymbopogon flexuosus* (Pootika), *Saccharum munja* (Munja), and *Chrysopogon zizanioides* (Ushir) is also the need of time for enriching the biodiversity through conserving the medicinal plants.

Keywords: Bundelkhand, Agro-geoclimatic conditions, Conservation, Pharmaceuticals, Secondary metabolites.

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EFFECT OF BILE SALT AND pH ON SURVIVAL AND BACTERIOCIN PRODUCTION BY *LACTOBACILLUS ACIDOPHILUS*

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Key words: Antagonistic activity, Bacteriocin, *Lactobacillus acidophilus*, Probiotic characterization.

Abstract – The present study focused on the effect of bile salt and pH on the survival and bacteriocin production by five isolates of *L.acidophilus*. The percentage reduction at different bile salt concentration and different pH with respect to time intervals were found to be significant. The result obtained indicated that all the five *L.acidophilus* isolates produced bacteriocins at different concentration of bile salt and at different pH, and showed varying zone of inhibition against the tested food spoilage and common enteric pathogenic bacteria. On the basis of present data it can be concluded that all the *L.acidophilus* isolates showed variable susceptibility for all the tested antibiotics and also comes in multi drug resistant (MDR) category. Further it can be concluded that all the *L.acidophilus* isolates fulfil basic criterion expected from probiotic strains, *i.e.* are capable of surviving in the *in vitro* conditions of the GIT at low pH and in the presence of the bile salts, can act as probiotic, and are helpful in the improvement of our intestinal flora. The verified antimicrobial activity of probiotic supports the development of this functional food as to the key improvement of the health of the consumers and use as food preservatives contents in different packed food products.

INTRODUCTION

Lactic acid bacteria which include genus *Lactobacillus*, are the most prevalently administered probiotic bacteria (Brashears *et al.*, 2003). Lactic acid bacteria (LAB) occur naturally in several raw materials like milk, meat and flour used to produce foods (Rodriguez, 1996). Lactic acid bacteria, mainly *Lactobacilli* and *Bifidobacteria*, may have several therapeutic functions, including antimicrobial activity, anticholesterol activity, improved lactose utilization, and anticarcinogenic activity (Chou and Weimer, 1999). Lactic acid bacteria are considered as a major group of probiotic bacteria. The probiotic concept has been defined by Fuller in 1989 that means “a live microbial feed supplement which beneficially affects the host animal by improving its intestinal microbial balance”. The probiotics are microbial cell preparations or components of microbial cells that have a beneficial effects on the health and well-being of the host (Salminen *et al.*, 1996). Another recent definition was by Schrezenmeir and De Vrese (2001) who defined probiotics as viable microbial food supplements which beneficially influence the health of the host.

Several *Lactobacilli*, *Lactococci* and *Bifidobacteria* are known to be health benefiting bacteria (Rolfe, 2000; Tuohy *et al.*, 2003). LAB constitutes an integral part of the healthy gastrointestinal (GI) microecology and is involved in the host metabolism (Fernandes *et al.*, 1988). Fermentation has been identified as a mechanism of probiotics (Gibson and Fuller, 2000). Lactic acid bacteria are useful for reduced lactose intolerance, alleviation of some diarrheas, lowered blood cholesterol, increased immune response and prevention of cancer (Marteau and Rambaud, 1996). Lactic acid bacteria along with other gut microbiota utilizes various substrates like biogenic amines, lactose, and allergenic compounds into short chain fatty acids along with other organic acids and gases (Fuller, 1989). LAB synthesizes enzymes, vitamins, antioxidants and bacteriocin (Knorr, 1998). LAB capable of producing antimicrobial peptides is used in a probiotic manner as food preservatives as well as health-promoting agents for humans (O'Sullivan *et al.*, 2002).

It has been observed that feed supplemented with few probiotic bacteria significantly reduce the numbers of enteropathogenic bacteria found in cattle rumen and feces (Brashears *et al.*, 2003). Lactic



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Isolation and identification of antagonistic *Lactobacillus acidophilus* from curd against MDR enteric pathogens

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Abstract

The present study is directed towards isolation and identification of antagonistic *Lactobacillus acidophilus* obtained by curd collected from local market of Prayagraj. After careful examination of cultural, morphological and biochemical characteristics, six strains of *Lactobacillus acidophilus* namely LA1, LA2, LA3, LA4, LA5 and LA6 were isolated. Antimicrobial activity of these six strains were evaluated by agar well diffusion method against *Staphylococcus aureus*, *Bacillus cereus*, *Escherichia coli* and *Salmonella typhi*. Cell free supernatant obtained from the isolated strains exhibited maximum antimicrobial activity against selected pathogens and the result reveals that strains of *Lactobacillus acidophilus* have a good antagonistic property and thus revealing that curd is safe and beneficial for consumption.

Keywords: Antimicrobial activity, curd, enteric pathogens, *Lactobacillus acidophilus*

Introduction

Lactic acid bacteria are a group of gram positive bacteria, non- pathogenic, non-spore forming, catalase negative, cocci or rod shaped frequently isolated from fermented dairy products and milkable to produce lactic acid as the end product of carbohydrate fermentation. Lactic acid bacteria attained major attention for their widespread use in the production of fermented foods due to having probiotic qualities (Savadogo *et al.*, 2006) [5]. They are used as starter culture in fermentation and some of them are natural components of intestinal microflora. Lactic acid bacteria especially *Lactobacilli* considered as potential probiotic, various strains of *Lactobacilli* are used as health promoting factors. *Lactobacilli* maintains the natural microflora of the body and also protects the human bodies from various disease causing bacteria. *Lactobacilli* represents a significant part of our intestinal microflora and their friendship with general state of human health is under investigation. The genus *Lactobacilli* is one of the major group of Lactic acid bacteria and is of great economic importance. Lactic acid bacteria have been receiving considerable attention as probiotics because of their innate ability to exert antagonistic activity. Appreciable number of research have been done on *Lactobacilli* with emphasis on their health promoting properties and mode of antimicrobial action. Strains of *Lactobacillus acidophilus* were introduced in the dairy products because of the potential advantages through various products delivering of probiotics to human are being practiced dietary supplements, dairy products such as curd, ice cream, cheese and other fermented products. *Lactobacillus acidophilus* gets its name from lacto= milk bacillus = rod- like in shape and acidophilus stands for acid loving. It occurs naturally in human and animals and produces only lactic acid. Curd is traditional fermented milk product and is a very popular menu at the end of the meal in India. Curd is a rich source of Lactic acid bacteria, due to availability of raw milk, easy manufacturing process, low cost and high nutritive value make curd as one of the popular food items in Indian subcontinents. By acknowledging curds suitability as dietary agent of providing probiotics to intestine due this property of curd in the recent year much attention is given to isolation of *Lactobacilli* from different sources. In order to provide health benefits by *Lactobacilli* present in curd they required relevant characterization and identification. The present study has been carried out with objective to screen identify and characterize *Lactobacilli* from locally available curd to study their antimicrobial activities due to presence of probiotic properties. Therefore, the present study was carried out to evaluate antimicrobial values of curd with respect to the presence of antagonistic *Lactobacillus acidophilus*.



Determination of Physico-chemical Properties in Soil Samples of Prayagraj (Allahabad) District, Uttar Pradesh, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Short Research Article

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ABSTRACT

Physico-chemical properties of soils from different land use systems viz. agriculture, olericulture, horticulture etc in Prayagraj (Allahabad) Uttar Pradesh were analyzed in 2018-19. Samples were collected from 4 different sites of Allahabad district viz., ECC gaughat, Jhansi, Karchhana & Subedarganj having distance between them of at least 4 kms. Some soils samples had higher water holding capacity & value of organic carbon. They have average value of pH and EC as compared to the cultivated soils. Potassium was found to be of low content in soil samples. Physical properties and parameters for all soils were average or medium whereas as variation in chemical properties were observed.

Keywords: Physical properties; chemical properties; Allahabad district; soil; physico-chemical; prayagraj.

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Effects of Ultraviolet-B Radiation on the Photosynthetic Pigments and Protein Content of Strawberry

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Authors' contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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Original Research Article

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ABSTRACT

The effects of ultraviolet-B (UV-B) radiations were studied on strawberry. The transplanted plants were irradiated with UV-B (280-320 nm) for 30, 60, 90 and 120 minutes on 20th, 40th, and 60th days after transferring. The enhanced UV-B radiation caused a negative effect on photosynthetic pigments and protein content of strawberry. Distinct decreased as a result of UV-B irradiation in contents of chlorophyll *a*, chlorophyll *b*, carotenoids and protein content was observed in strawberry. The impact of increase of duration of UV-B irradiation was also observed and found to be directly proportional.

Keywords: *Photosynthetic pigment; protein; UV-B; strawberry (Fragaria ananassa).*

1. INTRODUCTION

A decrease (1%) in ozone layer will cause an increase (2%) in UV-B radiation. The intensity of

UV radiation reaching the earth's surface depends on many factors, the most important of which are: The time of year and day i.e. the distance of sun from the earth, latitude and

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RESEARCH ARTICLE

HEAVY METAL ANALYSIS OF GANGA AND YAMUNA RIVER WATER

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ABSTRACT

Analysis was conducted for the concentration of Chromium (Cr) and Nickel (Ni) in the river Ganga on four sampling sites at Prayagraj Uttar Pradesh and the bioaccumulation of these heavy metals in the crops grown in the area. The main aim of this analysis was to analyze the concentration of these heavy metals and study their bioaccumulation and biodistribution in the crops and assess their effects on human and aquatic life. The concentrations of these heavy metals were compared with WHO 1993. The concentrations were found to be above the maximum permissible limits, showing detrimental effect of their presence on crops grown near the sampling sites.

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INTRODUCTION

Water is the most important resource to maintain life on this planet. The river Ganga is the most important river system in India. Due to the abundant availability of water throughout the year, it has played a major role in the development of Indian civilization and economy (Paul, Sinha, 2013). In India, water of many rivers has a special place in all religious activities. A large number of rivers and ponds have religious significance. Religious feelings of many pilgrims are so strong that they still consider these waters pure and sacred and consume it particularly during all religious ceremonies. Ganga river is one of those rivers which is most sacred river of India. Due to increase in population, urbanization and industrialization, water quality of Ganga river has been damaged and compromised by domestic sewage and industrial effluents, which contain a large number of chemicals and heavy metals (Pandey *et al*, 2011). After entering the water stream, metals are taken by many organisms and flora and eventually, they are stored in marine organisms and plant systems which are readily consumed by humans (Asaolu, *et al*, 1997). Due to the increased use of metal-based fertilizers in the agricultural revolution of government, due to water-scarcity, the

concentration of metal population in the fresh water has increased substantially. In river waters, metals are in the form of a mixtures, soluble and insoluble form such as ionic species, inorganic and organic compounds that are connected to the colloids and suspended particulate matter (Mitra, 2000), (Avantika, 2013). Metals are probably the most harmful pollutants because of their ability to create adverse effects on account of their non-biodegradability and its implications on nature and human beings, if their concentration exceeds the permissible limit (Lokhande, 2000), (Avantika, 2013). Metals enter the water system by natural or man-made sources, various industries and domestic sewages are included in the anthropogenic sources. Industries that emit metals in electrical industry, paints and pigment industries, ceramic pulp and paper industry, cotton textiles, steel plants, galvanization of iron products, iron and mining industries (Tyagi *et al*, 2000), (Avantika, 2013). These metals even in low levels, have cumulative effect on drinking water and groundwater (Prabha, 1997), (Avantika, 2013). Various environmental factors like temperature, pH, water hardness, dissolved oxygen, salinity, and organic matter can affect toxicity in metals (Bryan, 1976), (Dojlildo, 1993), (DAAF, 1996), (Avantika, 2013). In addition, the reduction of natural eradication procedures for metals increases the situation. As a result, the metal often comes in second place through harmful bioaccumulation in the second compartment, from one compartment to another within the aqueous environment.

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Physico-Chemical Parameters of River Ganga, Prayagraj, Uttar Pradesh, India

Syeda Anam Jameel and Justin Masih*

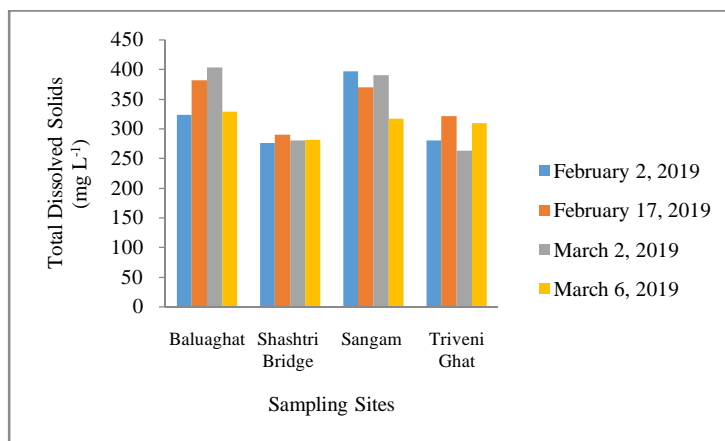
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ABSTRACT

In this paper a systematic study has been carried out to analyze the Physico-Chemical properties of River Ganga in Prayagraj District. Total forty samples from four different sampling sites and on four different dates were collected and analyzed for physico-chemical parameters (water temperature, pH, total dissolved solids, electrical conductivity, dissolved oxygen, biochemical oxygen demand, chloride, and fluoride). It was observed that most of the parameters were within permissible limit according to WHO (2009) and BIS (2004) with some exceptions where the values were slightly raised in comparison to others.

Graphical Abstract



Total Dissolved Solids.

Keywords: River Ganga, Physico-chemical parameters, Water potability, Water quality.

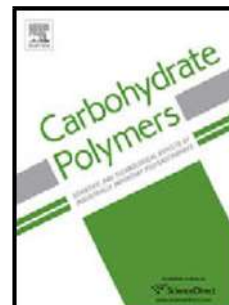
INTRODUCTION

Water is an essential natural resource. Earth is recognized as blue planet as it is covered with water. All living things need water to survive. Water is necessary for life existence. Nearly three-fourth of

Accepted Manuscript

Title: Simultaneous Oxidation and Esterification of Cellulose for Use in Treatment of Water Containing Cu(II) Ions

Authors: Arijit Dutta Gupta, Sweta Pandey, Vivek Kumar Jaiswal, Vivek Bhadauria, Harinder Singh



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Synthesis of IONP's decorated graft copolymers and study of their magnetic force-induced wastewater treatment

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Our work is focused on facile synthesis and modification of amylopectin-grafted block copolymers by using reversible addition-fragmentation chain transfer (RAFT) polymerization technique. This technique yields polymers with controlled molecular weight and low polydispersity indexes and is feasible with a wide range of monomers. Five different grades of amylopectin-grafted polymethacrylic acid and polyacrylamide block copolymers have been synthesized via RAFT, by varying the amount of acrylamide employing amylopectin-based macro chain transfer agent. Graft copolymers have been upgraded as smart responsive graft copolymers, through the incorporation of iron oxide nanoparticles (IONPs) via condensation reaction. The polymeric materials have been extensively characterized by energy-dispersive X-ray analysis, Fourier transform infrared spectroscopy, proton magnetic resonance spectroscopy, scanning electron microscopy, ultraviolet-visible spectroscopy, gel permeation chromatography, transmission electron microscopy, thermogravimetric analysis, and X-ray diffraction analysis. Normal and responsive graft copolymers have been studied for removal of model contaminant (kaolin), and responsive graft copolymers have been used to remove methylene blue dye (without using any adsorbent) from water by applying external magnetic field. The upgraded block copolymers have shown best performance in wastewater treatment.

KEYWORDS

amylopectin, graft copolymers, iron oxide nanoparticles, RAFT polymerization, wastewater treatment

1 | INTRODUCTION

Water is one of the most abundant natural resources; but only around 1% of this resource is available in the form of surface water and groundwater.^{1,2} To fulfill the needs of copiously growing population, large number of industries have been established, which are spreading an extensive amount of contaminants (heavy metals, inorganic compounds, organic pollutants, and many other complex compounds) in fresh water resources.³⁻⁷ This leads to the alteration of water cycle, which ultimately affects human health and wildlife.^{8,9}

In recent years, synthetic dyes have been widely used as coloring agents by many industries such as paper, plastics, food,

leather, textile, cosmetic, and pharmaceutical industries to color their products. Dye consumption is highest in the textile industry globally, and untreated water is discharged into water streams.¹⁰ Researchers have focused to resolve the problem of water pollution; rapid and significant advances in wastewater treatment have been made including photocatalytic oxidation, absorption/separation processing, flocculation, and bioremediation.¹¹⁻¹⁸ Most of the workers have separated dissolved toxic chemicals and harmful dyes through flocculation process by adding clay, bentonite, or kaolin for settling down the polymers/adsorbed dyes matrix. This process unnecessarily adds on the extra contaminants to water.¹⁹⁻²¹

Impact of Policy Measures on Growth of Fruits and Vegetables Processing Industry (FVPI) and Expectations of the Producers

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ABSTRACT

Realising the need for encouraging Fruit and Vegetable Processing Industry, during the end of Seventh Five Year Plan and more so during Eighth Plan period, some concrete measures were initiated by the Government of India to boost the horticultural sector. These measures are aimed at both strengthening the production base which is a must for increased processing, exports etc., and to encouraging the development of Fruit and Vegetable Processing Industries. Several other steps were taken by the Government to boost the sector after Eighth Five Year Plan. This paper is an attempt to see the growth of the industry, especially fruits and vegetables food processing units, based on primary survey done in fruits and vegetables processing units in Allahabad division. In view of the governments' measures taken in the last two and half decades, it is important to see the policy impact on the sector in terms of number of units and expectations of the entrepreneurs. It is interesting to see that although the number of units have increased and it clearly shows the policy boost up for the sector, but 'inspector Raj' is still alive in its full strength, industry/ entrepreneur is still expecting more easiness of the rules and regulations from government side.

Key Words : Food-processing Industry, Fruits and Vegetable based Processing Industry, Horticulture, Policy Measures, Government Initiatives, Inspector Raj

INTRODUCTION

India has wide variability of climate and soil. It produces a large range of horticultural crops, various types of fruits and vegetables. The government has identified horticultural crops as a means of diversifying agriculture, through efficient land use and optimum utilisation of natural resources (soil, water and environment) and as a way to create employment for rural masses (GoI, 2003). India is the second largest producer of fruits and vegetables after China in the world. Yet its share in the world trade of horticultural products is less than 1 per cent. The commercial processing of fruits and vegetables is less than 2 per cent. This compares very unfavourably with countries like Malaysia (83 %), Philippines (78 %), Brazil (70 %) and US (70 %). The main reason is that domestic consumption of processed items is quite meagre because of economic reasons and due to habit.

Indian consumers by and large prefer fresh fruits and vegetables. The domestic market mostly comprises defence purchases by Army Purchase Organisation (APO) and Canteen Stores Department (CSD) and hotels and restaurants (Financial Express). Nearly 45 per cent of total processed fruits and vegetables are exported (ibid). The household sector mainly uses items like ready to serve beverages and ketchups. The industry's growth in the post-reform period is attributed to various fiscal relief and policy initiatives like the delicensing of food processing, declaring a number of them high-priority industries, permitting foreign equity investments up to 51 per cent of the paid-up capital and removing restrictions under the Monopolies and Restricted Trade Practices (MRTP) Act. In spite of all these policy initiatives, the capacity utilisation of the industry has remained below 50 per cent in the post-reform period (Siddhu).

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Problems of Food Processing Industry

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ABSTRACT

Food-processing is regarded as the sunrise sector and is one of the focus sectors in Make in India initiative and is considered as one of the fastest growing sectors of the Indian economy in view of its large potential for growth and likely socio economic impact specifically on employment and income generation. With a number of fiscal relief and incentives, to encourage commercialisation and value addition, Government of India has accorded 'high priority' status to the food processing industry. Even after more than two decades of liberalisation it is very astonishing fact that the biggest problem faced by food processing units is government intervention *i.e.* Inspector Raj in all types of industries irrespective of their production volume, investment size, items they produced or location. Labour laws, Infrastructural bottlenecks, lack of electricity and high rate of electricity are the other major problems faced by these industries.

Key Words : Food-processing industry, Agro-based industry, Fruits and vegetable based processing industries, Horticulture, Fiscal incentive, Government intervention, Government initiatives, Inspector Raj, Liberalisation

INTRODUCTION

Food processing industry plays a vital role in India's development especially rural economy because of the vital linkages and synergies it promotes between industry and agriculture. India is the world's second largest producer of food after China. The arable land area of 159.7 mn hectares is the second largest in the world after the US and has a strong raw material base for the food processing industry. India is one of the largest producers of certain fruits, vegetables, pulses, cereals and dairy products but only 7 per cent of the total Indian perishable produce is processed (Assocham). Thus in India, the food sector has emerged as a high-growth and high-profit sector due to its immense potential for value addition; particularly within the food processing industry, increasing its contribution to world food trade every year. In terms of market size, the Indian food market was worth US\$ 193 billion in 2016 and is expected to cross US\$ 540 billion by 2020. The sector has been growing at the rate of 12 per cent annually, which is almost double the growth rate of

GDP. To achieve favourable terms of trade for Indian agriculture both in the domestic and the international markets fast growth in the food processing sector and simultaneous improvement in the development of value chain is of great importance.

In the context of Uttar Pradesh the Horticulture and Food Processing sector has vast prospects for capital investment, employment generation and augmenting rural income. In 2014-15 the contribution of agriculture and allied activities was 23% to the state's GSDP. The strategic location of UP, huge market, increased demand of processed products as a result of changing food habits, rapid urbanisation, increase in family income and busy life styles; low production cost, human resource, availability of raw material, diverse Agro climatic zones, well connected rail and road networks are the key investment enablers for the food processing sector in UP (UP Investor Summit, 2018).

In Allahabad division comprising of Fatehpur, Kaushambi, Pratapgarh and Allahabad total 67 units were in 2005, which have increased to 85 units in 2010. All the

BOUNDARY VALUES OF POLYTROPIC FLUID SPHERES USING RAMANUJAN’S METHOD

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ABSTRACT

A new approach for solving the nonlinear Lane-Emden equations, a basic equation describing the Newtonian equilibrium structure of a self-gravitating polytropic fluid sphere has been proposed. The nonlinear second order differential equation is solved using New Iterative Method and the boundary values of the obtained series has been calculated using Ramanujan’s method. It is used to model galactic structure, stellar interiors and stars clusters etc.

Keywords: Lane Emden Equation, Polytropic Model, Ramanujan’s Method

1. INTRODUCTION

Polytropes give simple structure of stars interior. It assumes a relation between pressure and density from the centre till boundary of a star. All physical quantities depend only on distance from the centre of the star. Assuming stars as isolated, static and spherically symmetric, then its structure can be defined using four fundamental equations.

$$\frac{dM(r)}{dr} = 4\pi r^2 \rho(r) \tag{1}$$

$$\frac{dP(r)}{dr} = -\frac{GM(r)\rho(r)}{r^2} \tag{2}$$

$$\frac{dL(r)}{dr} = \epsilon \rho(r) 4\pi r^2 \tag{3}$$

$$\frac{dT(r)}{dr} = \frac{-1}{4\pi r^2 \lambda} L(r) \tag{4}$$

In polytropic stellar model, $M(r)$, $P(r)$, $\rho(r)$, $L(r)$, $T(r)$ are mass, pressure, density, luminosity and temperature enclosed inside ‘ r ’ respectively. ϵ is the energy generation rate per kg, λ is the coefficient of conductivity and Pressure (P) and density (ρ) is related by the relation $P = K \rho^{(n+1)/n}$ and n is polytropic index. It was first considered by Lane¹ (1870) but the same problem was independently considered by Ritter² (1878).

Plugging the value of $M(r)$ in equation (2) and differentiating it with respect to r gives $\frac{1}{r^2} \frac{d}{dr} \left(\frac{r^2}{\rho} \frac{dP(r)}{dr} \right) = -4\pi G \rho(r)$ (5)

Introducing a dimensionless $y(r)$, $[y(r)]^n = \frac{\rho(r)}{\rho_c}$ where ρ_c stands for the density at the center of the star. This transforms eq. (5) to

$$(n + 1) \frac{K \rho_c^{1/n}}{4\pi G} \frac{1}{r^3} \frac{d}{dr} \left(r^2 \frac{dy(r)}{dr} \right) + y(r)^m \tag{6}$$

Introducing a dimensionless radius ‘ x ’ and plugging it in equation (6)

$$r = \left[(n + 1) \frac{K \rho_c^{1/n}}{4\pi G} \right]^{1/2} x$$

which finally yields the following

¹ Lane, J. H. (1870). On the Theoretical Temperature of the Sun under the Hypothesis of a Gaseous Mass Maintaining its Volume by its Internal Heat and Depending on the Laws of Gases Known to Terrestrial Experiment.. The American Journal of Science and Arts, 2nd series, 50: 57–74.

² Ritter, A. (1878). Wiedemann Annalen, 6:135.



Extension of Groups Using \tilde{p} -maps

Swapnil Srivastava¹ · Punish Kumar²

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Abstract In the present paper, by using a map namely, \tilde{p} -map on a group G , we have given a right loop $T = \{\tilde{p}(g) : g \in G\}$ for a fixed subgroup $K = \{g : \tilde{p}(g) = e\}$ of G . This T becomes a group under some certain conditions. (T, K, σ, f) , is a c-groupoid. There is a group extension G of group K with T as right transversal to K in G such that (T, K, σ, f) is c-groupoid associated with the extension G .

Keywords \tilde{p} -map · Right transversal · Right loop · c-groupoid · Group

A groupoid (G, \circ) with an identity in which the equation $X \circ s = t$ have a unique solution for the unknown X , is called a right loop. Groupoid (G, \circ) is called a loop if the equation $s \circ Y = t$ also have a unique solution for the unknown Y . We call a group G to be an extension of a group K if G contains K as a subgroup. For a group G and a set X , a map $*$: $X \times G \rightarrow X$ is said to be a *right action* of G on X if (i) $x * e = x$, (ii) $x * g_1 g_2 = (x * g_1) * g_2$.

Let G be a group (with identity e). Suppose K is a subgroup and T is a right transversal with identity to K in G . Then $G = KT$. Therefore each element of group G can be uniquely written as kt where $k \in K, t \in T$. Therefore for $s, t \in T$ and $k \in K$, we have $s.k = \sigma(s, k) \theta(s, k)$ and

$s.t = f(s, t) s \circ t$ where $f(s, t)$ and $\sigma(s, k) \in K$ $s \circ t$ and $\theta(s, k) \in T$. Thus we get a binary operation ‘ \circ ’ on T , an action ‘ θ ’ of K on T , a map $\sigma : T \times K \rightarrow K$ and a map $f : T \times T \rightarrow K$. For convenience, let us denote $\sigma(s, k)$ by $\sigma_s(k)$ and $\theta(s, k)$ by $s \theta k$. With respect to the binary operation ‘ \circ ’ defined by $\{s \circ t\} = T \cap Kst$, T is a right loop and a right loop can be embedded as a right transversal into a group (universal in some sense) [1].

A quadruple (T, K, σ, f) , where T is a groupoid with identity e , K a group which act on T from right through a given action θ , σ a map from T to K^K (the set of all maps from K to K) and f a map from $T \times T$ to K , is called a c-groupoid if it satisfies the following conditions:

- (C₁) $s \circ t = t \Rightarrow s = e$
- (C₂) For each $s \in T$, there exists $s' \in T$ such that $s' \circ s = e$
- (C₃) For each $s \in T$, let σ_s denote the image $\sigma(s)$ of s under the map σ . Then $\sigma_e = I_K$, the identity map on K
- (C₄) $f(s, e) = f(e, s) = 1$, the identity of K
- (C₅) $\sigma_s(k_1 k_2) = \sigma_s(k_1) \sigma_{s \theta k_1}(k_2)$
- (C₆) $(s \circ t) \circ u = s \theta f(t, u) \circ (t \circ u)$
- (C₇) $(s \circ t) \theta k = s \theta \sigma_t(k) \circ (t \theta k)$
- (C₈) $f(s, t) f(s \circ t, u) = \sigma_s(f(t, u)) f(s \theta f(t, u), t \circ u)$
- (C₉) $f(s, t) \sigma_{s \circ t}(k) = \sigma_s(\sigma_t(k)) f(s \theta \sigma_t(k), t \theta k)$

where $s, t, u \in T$ and $k_1, k_2, k \in K$.

We have already given an extension using p -map [2]. Throughout the paper we have assumed e to be the identity of the group G and right transversal to contain the identity of the group.

Definition 1 Let G be a group with identity e . A map $\tilde{p} : G \rightarrow G$ satisfying the properties: (i) $\tilde{p}(e) = e$, (ii) $\tilde{p}^2 = \tilde{p}$, (iii) $\tilde{p}(g_1 g_2) = \tilde{p}(\tilde{p}(g_1) g_2)$, is called a \tilde{p} -map.

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Prime ideals and ideal symmetry in near- rings

Ashok Kumar Pandey

Abstract

The most interesting and active field of current research in mathematics is theory of near- ring due to its wide application in coding theory, group theory, geometry, cryptography and block- designing etc. Near rings are one of the generalized structure of rings. Modern ring theory has very active mathematical discipline and studying rings in their own right. In this paper we study about 3- prime ideals and radicals in a Near-ring. Also, we study about 3- prime ideal and ideal symmetry in a Near-ring and its inter relationship between them.

Keywords: Near- ring, 3- prime ideal, Ideal symmetry, semi- simple ideal symmetric graph

Introduction

The most interesting and active field of current research in mathematics is theory of near- ring due to its wide application in coding theory, group theory, geometry, cryptography and block- designing etc. Near rings are one of the generalized structure of rings, The study and research on near- rings is very systematic and continuous. Near- rings around in all directions of mathematics and continuous research is being conducted, which show that their structure has power and beauty all its own. Modern ring theory has very active mathematical discipline and studying rings in their own right. The key ideas important to near- ring were formed by L.E. Dickson in 1905. Actually he gave the concept of near- field. In 1930 Wieland studied near- rings which were not near- fields. In this paper we study about 3- prime ideals and radicals in a Near-ring. Also, we study about 3- prime ideal and ideal symmetry in a Near-ring and its inter relationship between them.

1- prime ideal

An ideal I of a near- ring N is called 3- prime ideal, if $a, b \in N$ and $aNb \subseteq I$ implies either $a \in I$ or $b \in I$ and N is called 3 – prime near ring if $\{0\}$ is a 3 – prime ideal of N .

Example: Let $N = \{0, a, b, c\}$ be a near- ring with addition and multiplication are defined as:
 $0 + 0 = 0, 0 + a = a, 0 + b = b, 0 + c = c. a + 0 = a, a + a = 0, a + b = c, a + c = b, b + 0 = b, b + a = b, b + b = 0, b + c = a, c + 0 = c, c + a = c, c + b = a$ and $c + c = 0.$

$0.0 = 0, 0.a = 0, 0.b = 0, 0.c = 0. a.0 = a, a.a = a,$
 $a.b = 0, a.c = a, b.0 = b, b.a = b. b.b = b, b.c = b,$
 $c.0 = b, c.a = c, c.b = b, c.c = c.$

Then $\{0, a\}$ is a 3- prime ideal of N .

Proposition 1.1: Every equi-prime ideal is 3- prime ideal but every 3- prime near ring need not be an equi-prime near ring.

Note: Equi-prime ideal \Rightarrow 3- prime ideal \Rightarrow prime ideal.

Example: Let $(N, +, \cdot)$ be any group with at least three elements. We define multiplication on N as:

$a \cdot b = a, \text{ if } b \neq 0 \text{ and}$
 $0, \text{ if } b = 0$

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Prime ideals and radical of ideals in near- rings

Ashok Kumar Pandey

Abstract

The most interesting and active field of current research in mathematics is theory of near- ring due to its wide application in coding theory, group theory, geometry, cryptography and block- designing etc. Near rings are one of the generalized structure of rings. In this paper we discuss the concepts of ideals and radicals in near- rings also the concepts of m - system and sp - system in context of near- rings. Also, the concepts of m^* - system, m^* - sequences and prime radicals in near rings.

Keywords: Near- ring, prime ideal, semi- prime ideal, radical of ideal, m - system, sp - system, m^* - system.

Introduction

The most interesting and active field of current research in mathematics is theory of near- ring due to its wide application in coding theory, group theory, geometry, cryptography and block- designing etc. Near rings are one of the generalized structure of rings, The study and research on near- rings is very systematic and continuous. Near- rings around in all directions of mathematics and continuous research is being conducted, which show that their structure has power and beauty all its own. Modern ring theory has very active mathematical discipline and studying rings in their own right. In 1930 Wieland studied near- rings. In this paper we discuss the concepts of ideals and radicals in near- rings also the concepts of m - system and sp - system in context of near- rings. Also, the concepts of m^* - system, m^* - sequences and prime radicals in near rings.

Definition 1.1: A system $(N, +, \cdot)$ is called a near- ring if

- $(N, +)$ is a group (not necessarily abelian).
- (N, \cdot) is a semi group
- Multiplication is either left distributive or right distributive over addition. That is $(n_1 + n_2) \cdot n_3 = n_1 \cdot n_3 + n_2 \cdot n_3$,
 Or, $n_1 \cdot (n_2 + n_3) = n_1 \cdot n_2 + n_1 \cdot n_3$, for all $n_1, n_2, n_3 \in N$.

Example 1: Every ring is a near- ring.

Definition 1.2: A subset S of a near- ring N is called an m - system if for every $a, b \in S$, there exist $a_1 \in \langle a \rangle$ and $b_1 \in \langle b \rangle$ such that $a_1, b_1 \in S$.

Example 2: Let $M = \mathbb{Z}_4 = \{0, 1, 2, 3\} \text{ mod}(4)$, $S = \{1, 2\} \text{ mod}(4)$. Clearly, $S \subseteq \mathbb{Z}_4$, S is an m - system.

Theorem 1.3: An ideal P in N is a prime ideal if and only if its complement P^c is an m - system.

Proof: Suppose that P is a prime ideal then to prove that P^c is an m - system.
 Let $a, b \in P^c \Rightarrow \langle a \rangle \subseteq P^c$ and $\langle b \rangle \subseteq P^c$
 $\Rightarrow \exists a_1 \in \langle a \rangle \subseteq P^c$ and $b_1 \in \langle b \rangle \subseteq P^c \Rightarrow \langle a \rangle \not\subseteq P$ and $\langle b \rangle \not\subseteq P$
 Hence by the definition of prime ideal we have, $\langle a \rangle \langle b \rangle \not\subseteq P$.

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Relation of radicals with strong vertex connectivity and ideal symmetry in near rings

Ashok Kumar Pandey

Abstract

The most interesting and active field of current research in mathematics is theory of near-ring due to its wide application in coding theory, group theory, geometry, cryptography and block-designing etc. Near rings are one of the generalized structure of rings, the study and research on near-rings is very systematic and continuous. Near-rings around in all directions of mathematics and continuous research is being conducted. In this paper we study about the relation of radicals in a Near ring with strong vertex connectivity of graphs.

Keywords: Nil radical, 3- semi prime ideal, ideal symmetric graph, zero- symmetric graph.

Introduction

The most interesting and active field of current research in mathematics is theory of near-ring due to its wide application in coding theory, group theory, geometry, cryptography and block-designing etc. Near rings are one of the generalized structure of rings, the study and research on near-rings is very systematic and continuous. Near-rings around in all directions of mathematics and continuous research is being conducted, which show that their structure has power and beauty all its own. Modern ring theory has very active mathematical discipline and studying rings in their own right. The key ideas important to near-ring were formed by L.E. Dickson in 1905. Actually he gave the concept of near-field. In 1930 Wieland studied near-rings which were not near-fields. In this paper we study about the relation of radicals in a Near ring with strong vertex connectivity of graphs.

Theorem 1.1: Let I be an ideal of N . If I be a non zero nil radical, then I be a strong vertex cut of $(G_I(N))$. If I be a strong cut of $(G_I(N))$ and for all $e \in I$ $x^n = 0$, then I is a nil radical.

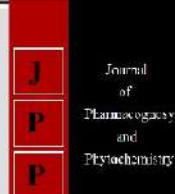
Proof: Suppose that I be a nil radical of N . If $I = N$, then there is nothing to prove. Let $I \neq N$ and $x, y \in N$ such that $x \neq y$. If possible, suppose that there exists an edge between the vertices x and y in $(G_I(N))$, then either $xNy \subseteq I$ or $yNx \subseteq I$. without loss of generality, suppose that $xNy \subseteq I$. Since I is a nil radical, therefore, $xNy \subseteq I$ and either $x^n = 0$ or $y^n = 0$ implies that either $x \in I$ or $y \in I$. But this is a contradiction to the fact that $x, y \in N \setminus I$. Hence, I is a strong vertex cut.

Conversely, suppose that I is 3- semi-prime ideal and I is a strong vertex cut of $(G_I(N))$.

Claim: I is a nil radical. We take $x, y \in N \setminus I$ such that $xNy \subseteq I$ and either $x^n = 0$ or, $y^n = 0$. Since I is 3- semi-prime ideal of N therefore $x = y$ implies $x \in I$. Let $x \neq y$. If it possible then suppose $x \in N \setminus I$ and $y \in N \setminus I$. Since I is a strong vertex cut of $(G_I(N))$, therefore, there is no edge between x and y in $(G_I(N))$. It implies that $xNy \not\subseteq I$ and $yNx \not\subseteq I$. But this is a contradiction. Therefore, either $x \in I$ or $y \in I$. Hence, I is a nil radical.

Proposition 1.2: Let I be a non zero nil radical of N then $K(G_I(N)) = |I|$.

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Antimicrobial activity of *Cynodon dactylon* against MDR bacteria

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Abstract

The antimicrobial activity of *Cynodon dactylon* (Grass) were determined and compared against 2 Gram+ve bacteria (*Staphylococcus aureus* and *Bacillus cereus*) and 2 Gram-ve bacteria (*Salmonella typhi* and *Escherichia coli*), which are Multi Drug Resistant (MDR). The *Cynodon dactylon* leaves were crushed and their extract was taken in Propanol. The efficiency of the extract were tested against MDR bacteria through well diffusion assay. In this endeavor the antimicrobial assay extract show inhibitory or antimicrobial activity against MDR bacteria. The propanol extract of *Cynodon dactylon* showed maximum antimicrobial activity against *Staphylococcus aureus* (Gram+ve) followed by *Bacillus cereus* (Gram+ve) while there is no antimicrobial activity obtained against *Salmonella typhi* (Gram-ve) and *Escherichia coli* (Gram-ve). On the basis of present finding it was concluded that the extract possess antimicrobial and pharmacological properties, hence can be used parallel to synthetic drugs which have undesirable side effects.

Keywords: *Cynodon dactylon*, MDR, antimicrobial activity, *S. aureus*, *B. cereus*, *S. typhi*, *E. coli*

Introduction

Infectious disease accounts for high proportion of health problems. Mortality due to these infections continues to be a major problems. Infections due to variety of microbial agents, such as pathogenic *Staphylococcus aureus*, *Bacillus cereus*, *Salmonella typhi* and *Escherichia coli* which are Multi Drug Resistant (MDR) are most common (Mukherjee *et al.*,1998) [7]. In present time multiple drug resistance in pathogenic microbes become a serious problem of humankind world wide (Peng *et al.*,2006) [8]. Synthetic drugs are not only expensive but also often associated with side effects. Therefore we have to control microbial infection via new infectious fighting strategies. However, the previous studies of rapid, widespread emergence of resistance for new antimicrobial agents indicates that even new families of these agents will have a short life expectancy while there are some advantages of using medicinal plants, such as often better patience tolerance, fewer side effects, relatively less expensive, acceptance due to long history of use and being renewable in nature. For all these reasons, researcher are increasingly turning their attention to herbal products, for development of new better drugs against multiple drug resistant microbial strains (Benkeblia, 2004) [3]. With the increasing incidence of antibiotic resistance by several pathogenic microbial agents, antimicrobial evaluation of medicinal plants has become the need of the hour. Biomolecules derived from plants have an advantage of being less toxic in comparison to synthetic agents (Gideon *et al.*,2016) [6]. According to WHO more than 80% worlds' population depends upon traditional medicine for their primary healthcare needs. Herbal medicine support about 75-80% of whole population and major part of routine therapy involves use of plant extract and active constituents (Akerle,1993) [1]. Medicinal plants are rich in various secondary metabolites of antimicrobial activities such as terpenoids, flavenoids, saponins, alkaloids alkenyl phenols, tannins, phorbol esters and glycoalkaloids. The screening of products of plants for antimicrobial properties have shown that the higher plants represent a potential source of novel antibiotic prototypes (Afolayan, 2003). The increased incidence of multiple resistances in human pathogenic microorganisms in recent years, largely due to unselective use of commercial antimicrobial drugs commonly used in the treatment of infectious diseases. This has forced scientist to search for new antimicrobial substances from medicinal plants. However, very few information is available on such activity of plants and out of 4 lakhs plant species on earth, only some has been studied for antimicrobial activities. Plant based medicinal substances are basis of many of the modern pharmaceuticals we use today for our various ailments. The plant kingdom harbors an inexhaustible source of active ingredients invaluable in intractable disease.

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Volume & Contents

[Vol.7, No. 1, July :2019 \(http://intellectuallink.in/vol7.php\)](http://intellectuallink.in/vol7.php)
[Vol.6, No. 1, July :2018 \(http://intellectuallink.in/vol6.php\)](http://intellectuallink.in/vol6.php)
[Vol.5, No. 1, July :2017 \(http://intellectuallink.in/vol5.php\)](http://intellectuallink.in/vol5.php)
[Vol.4, No. 1, July :2016 \(http://intellectuallink.in/vol4.php\)](http://intellectuallink.in/vol4.php)
[Vol.3, No. 1, July :2015 \(http://intellectuallink.in/vol3.php\)](http://intellectuallink.in/vol3.php)
[Vol.2, No. 1, July :2014 \(http://intellectuallink.in/vol2.php\)](http://intellectuallink.in/vol2.php)
[Vol.1, No. 1, July :2013 \(http://intellectuallink.in/vol1.php\)](http://intellectuallink.in/vol1.php)

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VOL. 7, NO. 1, JULY : 2019

Section – I (PHILOSOPHICAL PROBLEMS)

Daya Krishna's Philosophy of Integral Pluralism
Sanjay Kumar Shukla

Section – II (PHILOSOPHY OF SAINTS)

कबीर साहित्य में समन्वय साधना
अरविन्द विक्रम सिंह


Section – III (PHILOSOPHICAL PROBLEMS)

Philosophical Counselling and Finding More Meaning in Life
Prahlad Singh Shekhawat

दार्शनिक अभ्यास : मानसिक-दुरावस्था का निदान
राजवीरसिंह शेखावत

Section – IV (WELL BEING AND QUALITY OF LIFE)

Laser-Induced Breakdown Spectroscopy Coupled with PCA Study of Human Tooth

A. K. Pathak¹ · Ankita Singh² · Rohit Kumar³  · A. K. Rai³

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Abstract The present study focuses on the laser-induced breakdown spectroscopy (LIBS) studies on different parts of tooth samples. The hardness of different parts of tooth samples belonging to different age groups has been studied using ionic-to-atomic intensity ratio of Ca spectral line. From this ratio, we infer that enamel is the hardest part of teeth. The principal component analysis (PCA) on LIBS data of different parts of teeth gives PC1 (96%) and PC2 (4%), which explains maximum variance present in data set. Therefore, this work demonstrates the suitability of LIBS along with PCA for routine in vitro/in vivo dental practices.

Keywords LIBS · Human tooth · Enamel · Dentin · Cementum · PCA

The tooth consists of two sections: crown and root. Crown part is composed of enamel and dentin, whereas cementum is the root part. These parts are shown in cross-sectional view of tooth in Fig. 1. The elemental analysis of tooth samples can

also be used to identify health problems, such as identification of tooth affected by caries. The feasibility of laser ablation-based analytical methods for quantitative and qualitative microspatial analysis of different samples has been reported in the literature [1–3]. The advantage of real-time and in situ elemental analysis without sample preparation with LIBS is attractive for the analysis of biological samples [4, 5]. Furthermore, LIBS can provide information about the spatial location of the major and trace elements present in the target matrix, which is not possible by conventional elemental analysis techniques [6, 7]. Hence, LIBS is a suitable alternative method for tooth diagnosis. Previously, Niemz has evaluated the application of LIBS for the analysis of tooth samples [8, 9]. Samek et al. [10, 11] presented the utility of LIBS technique for the analysis of minerals and potentially toxic elements present in calcified tissues like bones and teeth to indicate the influence of environmental exposure and other biomedical factors. Bilmes et al. [12] have used LIBS to identify the trace elements in hominid teeth to analyze their eating habits. Tawfik and El-Tayeb have studied a number of human enamel of Egyptians using LIBS [13]. Statistical methods are used to interpret spectroscopic data in many applications including study of forensic evidences and biomaterial identification [14]. Each spectrum collected using LIBS is a fingerprint of the material being analyzed. Therefore, in the present work, we have applied LIBS technique in combination with PCA to distinguish the different parts of tooth samples.

The tooth samples from patients were obtained from Vinayak Hospital, Allahabad, India. These samples were washed in distilled water and dried at room temperature. The samples were cut and visually examined by expert dentist and then used for the LIBS analysis. We focused high-energy laser pulse to create plasma on the surface of the tooth samples. A part of this energy is used to ablate a

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PAPER

Study of structural and surface morphological properties of Tb doped ZnO nanoparticles using XRD, XPS and fractal analysis

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27 September 2019Anil Kumar^{1,8}, A Sharma^{2,8}, Savita Bhasker³, R P Yadav^{4,9}, H P Bhasker⁵, P K Priya⁶, K L Pandey⁶, Satish Kumar Mandal⁷ and R K Anand³¹ Department of Physics & Electronics, Dr Ram Manohar Lohia Avadh University, Faizabad-224 001, India² Department of Science and Humanities, K. J. Somaiya College of Engineering, Mumbai-400077, India³ Department of Physics, University of Allahabad, Allahabad-211002, India⁴ Department of Physics, Government PG College, Saidabad- 221508, India⁵ Department of Physics, C.M.P. Degree College, University of Allahabad, Allahabad-211002, India⁶ Department of Physics, Ewing Christian College, University of Allahabad, Allahabad-211 003, India⁷ Surface Physics and Materials Science Division, Saha Institute of Nuclear Physics, Kolkata-700064, India⁸ Equal contribution.⁹ Author to whom any correspondence should be addressed.E-mail: aurampratap@gmail.com and anand.rajkumar@rediffmail.com

Keywords: ZnO, atomic force microscopy, XPS, fractal dimension, height-height correlation function, auto-correlation function

Abstract

A systematic study was performed on Tb³⁺ doped ZnO nanoparticles of different mole-fraction using Atomic Force Microscopy (AFM), X-ray Diffraction (XRD) and X-ray Photoemission Spectroscopy (XPS) measurements. XRD studies confirm that all the samples are in wurtzite phase. XRD analysis suggests a compressive lattice strain as doping concentration increases. The strain generated in the doped samples is found to be more as compared to pure nanoparticle samples. XPS result indicates the presence of several oxygen species adsorbed on the surface. Furthermore, the effect of incorporation of Tb³⁺ ions into ZnO nanoparticles was explored using fractal analysis approach to extract the quantitative surface parameters. The fractal dimension is a scale invariant technique for representation and understanding of surface morphology of nanostructures. Fractal dimension provides a clear distinction between vertical and horizontal properties of the surfaces and their correlation. This technique could be very useful in selecting the suitable substrate for various technological applications. The lateral correlation length was estimated by auto-correlation function. While, the roughness exponent and fractal dimension were calculated from height-height correlation function. Moreover, this study reveals that the complexity of surface increases with doping. Moreover, as doping increases, the surface becomes more and more zagged as compared to pure samples.

1. Introduction

The pure and rare earth/transition element doped ZnO semiconductor nanocrystals have been investigated at large scale in the last few decades due to their wide variety of applications [1–4]. These nanoparticles are of great interest as they are easy to grow which reduces the production costs. Quantum confinement effects can be observed in the undoped and doped ZnO nanoparticles when a critical size is reached, which leads to a widening of the band gap. A significant fraction of atoms residing on the surface of these nanoparticles have a profound impact on their optical and electronic properties. Luminescence properties of the ZnO nanoparticles can easily be tailored by varying the size or the composition of the dopant element in these nanoparticles, without changing their processing properties. ZnO nanoparticles have a wide application in the field of optoelectronics, because of their unique optical properties [2, 5]. And so, these nanoparticles have attracted tremendous attention due to their potential applications in dye-sensitized solar cells [6, 7], gas-sensors [5, 8] etc. This material has a lot of prospects for application in light emitting diodes (LEDs) as well especially in UV-LEDs [1, 9–12]. By reducing the size of these nanoparticles, one can modify the electron-phonon coupling strength which

Review Article

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Conservation and Wildlife Management-A Review

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ABSTRACT

Keywords

Conservation,
Diversity and
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Presently conservation of biodiversity is of utmost challenge. It requires collaborative efforts for success in modern changing world. Thus, a great challenge has emerged to conserve and minimise the losses of the wildlife in the changing environment. Efforts of conservation with respect to wild life require a great deal of plan. This review highlights the major issues about wildlife life extinction, endangerment and conservation. Habitat conservation is the key solution to conserve biodiversity. Lot of efforts has been done to encourage forestation and decrease deforestation and practices has been done in many areas.

Introduction

Nation India is a vast nation with immense beauty possessing a rich heritage of wild animal e.g. tiger, lion, leopard, elephant, fox, bear, deer, rhinoceros are found in abundance. India has more types of the graceful deer and cats than any other country in the world. There are 120 families of terrestrial vertebrates in India. 400 species of mammals, 1200 species of Birds, 350 Species of Reptiles and more than 29,70,000 species of insects has been reported. “Wildlife management” may be defined for present purposes as “the management of wildlife populations in the

context of the ecosystem. An important aspect to manage and conserve the wildlife is to conserve and protect their natural habitat (Lyster, 1985; Geist and McTaggart-Cowan, 1995; Moulton and Sanderson, 1999; Vasarhelyi and Thomas, 2003).

Protected areas network

Post independence India saw a spurt in developmental activities. As a result, more and more forest land gave way for agriculture, industry and infrastructure development. Rapid growth of human and livestock populations and consequent pressures on

Review Article

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Insect Growth Regulators for Insect Pest Control

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ABSTRACT

Insecticides with growth regulating properties (IGR) may adversely affect insects by regulating or inhibiting specific biochemical pathways or processes essential for insect growth and development. Some insects exposed to such compounds may die due to abnormal regulation of hormone-mediated cell or organ development. Other insects may die either from a prolonged exposure at the developmental stage to other mortality factors (susceptibility to natural enemies, environmental conditions etc.) or from an abnormal termination of a developmental stage itself. Insect growth regulators may come from a blend of synthetic chemicals or from other natural sources, such as plants. The chemical composition of hormones indigenous to insects is now being studied and used as a basis for developing analogs or mimics against insects. The similarities, however, in certain aspects of biochemistry among vertebrates and invertebrates may result in the limited development of IGRs. Environmental contamination also creates a hurdle as well as a challenge for industries to develop compounds that provide a more environmentally or ecologically sound insect pest control. As part of on-going search for new biologically active molecules prepared from compound of natural origin, we thought of Insect Growth Regulators as substitute to insecticides that are commercially used.

Keywords

Insect growth regulators, Carvacrol, Derivatives insect pests, Insect hormones

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Introduction

Insect Growth Regulators (IGRs) are compounds which interfere with the growth, development and metamorphosis of insects. IGRs include synthetic analogues of insect hormones such as ecdysoids and juvenoids and non-hormonal compounds such as precocenes (Anti JH) and chitin synthesis inhibitors. Natural hormones of insects which

play a role in growth and development are: 1. Brain hormone: They are also called activation hormone (AH). AH is secreted by neuro secretory cells (NSC) which are neurons of central nervous system (CNS). Its role is to activate the corpora allata to produce juvenile hormone (JH). 2. Juvenile hormone (JH): Also called neotinin. It is secreted by corpora allata which are paired glands present behind insect brain. Their role is to keep the larva in