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PLATINUM OPEN ACCESS

COMMUNICATION

Diversity and distribution of figs in Tripura with four new additional records

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Abstract: The genus *Ficus* L., commonly known as Fig plays an important role in the forest ecosystem, being a keystone species. Taxonomic revision, habitat assessment, and floristic study of the genus *Ficus* of northeastern region are scanty and still lacking. As the genus is rich in diversity, this region possesses tremendous scope for utilisation of its members, as many species belonging to this genus carry good properties for diverse uses for the benefit of mankind. Therefore, the present study has been undertaken for identification of the collected taxa, diversity assessment of the wild as well as planted species, distribution throughout the state and preparation of a comprehensive checklist along with measures of diverse functions and ecological role of the genus *Ficus* in Tripura, North-East India. Field survey was conducted between April 2017–August 2018 throughout Tripura and all the locations were marked with GPS which is given in the present distribution map of *Ficus* in Tripura. This study is based on extensive field survey and specimen collection. Key taxonomic description, both accepted and vernacular names, phenology, and diverse habitat function of all species have been provided. Based on the available literatures, distribution information of the present records were calculated. Evaluation of diverse ecological role were scored based on the published literature and field observations. In the present study, 23 taxa of *Ficus* have been reported from the study area including four new distribution records. Most of the *Ficus* species recorded in this study were from moist mixed deciduous and secondary forests. Out of 23 species of *Ficus* recorded in the present study, seven (7) species belong to evergreen small tree to shrub (*F. benghalensis*, *F. drupacea*, *F. elastica*, *F. microcarpa*, *F. racemosa*, *F. sarmentosa* and *F. semicordata*); three (3) species recorded are large deciduous tree (*F. racemosa*, *F. religiosa* and *F. rumphii*). Fleshy fruited trees are the most preferable option for survival of frugivores over diverse habitats and thus, plays major role for entire ecosystem restoration. The present work will be useful to understand the critical interactions between plants and frugivore at different trophic levels. Further, *Ficus* groups tend to have multiple ecological roles, and as a result there exists huge scope to understand the mechanisms of plant functional traits for conservation of threatened frugivore diversity.

Keywords: Conservation, ecological roles, Ficus, frugivore, northeastern India.

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Competing interests: The authors declare no competing interests.

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Author contribution: All authors have contributed equally. This is a collaborative work and have been modified by authors from time to time wherever required.

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Anatomical Features a Moth Orchid , *Phalaenopsis deliciosa* subsp. *hookeriana* (O. Gruss & Roellke) from Tripura, Northeast India

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Abstract: *Phalaenopsis deliciosa* subsp. *hookeriana* a moth orchids, is reported for the first time from Tripura. Present study deals with its anatomical description of the aerial root and leaf internal structure. The collateral vascular bundle in leaf which is surrounded by homogenous mesophyll, epidermis and cuticle were examined. The anomocytic type of stomata are present in this species and estimated stomatal density was 2.1/92.9 mm^2 and stomatal index was 3.71%. The root anatomical study revealed that it having uniseriate velamen as additional adaptive feature. Pelotons of mycorrhzia were also identified in the root cortex. This species blooms in Agust to September in moist deciduous forest of Atharomura at an altitude of 145m amsl on the trunk of *Artocarpus chama* Buch. Ham.

Keywords: Orchidaceae, Uniseriate velamen, Mycorrhiza, Distributional extension

The genus *Phalaenopsis* was first described by Carl Ludwing Blume in 1825. The generic name *Phalaenopsis* is derived from the Greek word '*Phalaena*' (moth) and '*opsis*' (resemblance) and thus they are commonly called 'moth-orchids'. The genus represents by 62 species (Christenson 2001) and is widely distributed throughout the world. In India the genus is represented by 14 species (Misra 2007) distributed throughout the Himalayas, Peninsular India and Andaman and Nicobor Islands. Gogoi (2012) reported five species from Assam and earlier one species also reported from Goa, Western Ghats (Jadhav et al 2015). *Phalaenopsis* are mostly epiphytic, shade loving, monopodial orchids and some are lithophytes. The species have adapted to moist and humid forest and grow below the canopy to avoid direct sunlight. Only thirty one orchid species belonging to twenty two genera were mentioned in the state flora of Tripura (Deb 1983). Recently, few orchid species were reported as new for the flora of Tripura (Baishnab et al 2017, Baishnab and Datta 2019). *Phalaenopsis deliciosa* subsp. *hookeriana* (O.Gruss & Roellke) Christenson has not been reported by earlier worker from Tripura (Deb 1983) and thus, this is the first report on the occurrence of this epiphytic orchid from Tripura, North East India. So far, this species has also been recorded from Sikkim, Arunachal Pradesh, Meghalaya, Assam, Jharkhand, Andhra Pradesh, Karnataka, Kerala, Tamil Nadu and Andaman Island. The single distributional record and population scarcity of the orchid might be associated with its rarity. As it has already been listed in CITIES Appendix II (CITES 2019; ENVIS 2019), hence proper conservation measure should need to take to restore its wild population. Tripura is a small hilly state of North Eastern region of India, with a geographical area of 10491sq.km and is situated between 22°57' and 24°33' North latitudes and 91°10' and 92°20' East longitudes, surrounded by Bangladesh on three sides. The total forest area is 6294 km^2 which is 60.02% of the total geographical area of the state. There has not been much addition to the earlier reported number of orchids due to lack of proper exploration and documentation.

Maximum numbers of orchid of the family are from epiphytic habitat (Benzing et al 1982, Benzing 1986). The studied orchid species grows in epiphytic habitat with an average temperature of 30°C to 35°C and 50% to 74% relative humidity and exposed to full sunlight during summer. During the dry season this habitat becomes more susceptible to draught due to low humidity. Usually they have to overcome these difficulties for survival through some changes in their morphological parts and anatomical structures. Mycorrhizal fungi are in symbiotic relation with orchid roots from the very begining of orchid seed germination. Therefore, the aim of the present study was to examine the anatomical features of leaf and root to know any anatomical adaptations of this species if available which helps the species to survive in a wide range of climatic and edaphic conditions, and to describe with its additional distribution record from Tripura.

MATERIAL AND METHODS

During the floristic survey of Atharomura region in August 2018, one epiphytic orchid was collected in flowering condition. Geographical data, field photo, habit and habitat and other ecological data were recorded during the field study. Taxonomical enumeration was done by complete

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RESEARCH ARTICLE

A culture based diversity of saprobic fungi associated with leaf litter of *Hevea brasiliensis* along a chronosequence of plantations in Tripura, Northeast India

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Abstract
The present study aimed to assess the diversity of saprobic fungi associated with three decompositional stages of *Hevea brasiliensis* (Wild. ex Juss.) Mull. Arg. leaves along a chronosequence of plantations. The modified surface disinfection culture method was followed for isolation of saprobic fungi from three different phases (G_1, G_2 and G_3) of decomposing leaves. The result revealed 51 species of fungi isolated from three plantations. There was an increasing trend of number of species along a chronosequence of plantations. *Cladosporium* sp. was isolated from all the phases of decomposition from all the three plantations. There is an increasing trend in diversity and a decreasing trend in dominance of fungi along a chronosequence of plantations. Overall, higher number of species and maximum diversity was recorded in G_2 ($H' = 3.61$) among the decompositional phases. The study suggests increase in diversity along a chronosequence of plantations and the similarity index suggests distinct fungal occurrence pattern in the leaf litter along a chronosequence of plantations.

Keywords Age · *Cladosporium* · Decompositional stages · Fungal composition · Rubber plantation · Saprophytic fungi

Introduction

Tripura is the second largest rubber (*Hevea brasiliensis* (Wild. ex Juss.) Mull. Arg.) producer in India. The plantations were introduced in 1963 to check soil deterioration due to slash and burn agriculture practiced by the local people occupying more than 40,000 ha area in the state (Chaudhuri et al. 2013). The current position of natural rubber in the state is essentially an outcome of the institutional interventions conceived and implemented by the Rubber Board and the State Government of Tripura during the past five decades (Sharma et al. 2014).

The litter decomposition is a vital process of nutrient cycling in forest ecosystems (Charley and Richards 1983). Physical and biological processes are involved in releasing nutrient from decaying organic matter (Bake and Attiwill 1985). Among the biological processes, microbes particularly fungi were regarded as efficient decomposers of organic matter, especially plant litter (Dickinson and Pugh 1974). Fungi contributed substantially to such complex phenomenon of nutrient recycling in forest ecosystems as they produce various extracellular enzymes that breakdown the different organic compounds in the litter (Baldrian and Lindahl 2011) including lignocellulose which other organisms were unable to decompose (De Boer et al. 2005).

The pattern of diversity and functioning of fungi associated with litter decomposition in Asian forests of different climatic regions were examined by meta-analysis (Osono 2011). The diversity of saprobic fungi on decaying branch and leaf litter of *Hevea brasiliensis* were also investigated (Seephueak et al. 2010, 2011). The biodiversity of microfungi associated with litter of *Pavetta indica* was studied earlier (Shanthi and Vittal 2010). Fungal diversity in leaf litter of *Anacardium occidentale* was reported (Shanthi and Vittal 2012). The diversity of leaf litter fungi in a seasonally dry tropical forest was reported (Prakash et al. 2015).

The literature survey revealed that no reports are available regarding the saprobic fungi associated with different decompositional stages of rubber leaf litter. However, there

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Impact of acculturation to western culture (AWC) on western fashion luxury consumption among Gen-Y consumers in the Asia-Pacific region

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ABSTRACT

Gen-Y consumers in the Asia-Pacific region are an attractive market for Western fashion luxury. This study investigates how Gen-Y consumers' acculturation to Western culture (AWC) tendency drives their intention to purchase Western fashion luxury.

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How self-construal drives intention for status consumption: A moderated mediated mechanism

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Journal of Education Culture and Society

A Comprehensive Framework of Design Thinking Approach in Knowledge Management: A Review in Academic Context

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Keywords: KM, DT, design knowledge, knowledge sharing, educational institutions, design systems.

Abstract

Aim of research. Design thinking (DT) is an essential context for knowledge management (KM), as it promotes the link between KM initiatives and an organization's strategic goals and objectives. This article analyzes the DT process in terms of its capability to create KM. The detailed analysis on the aspect of the working mechanism of DT – how KM is represented and created in the process. This article examines the DT procedure in terms of its ability to generate design knowledge. In this regard, the main purpose of this paper is to review the approaches to KM applied to DT and to suggest directions for how such a supervisory system could evolve.

Methodology. This study is thematic in its nature and it was prepared on the basis of secondary data and also based on an inclusive review of the literature and similarly computation of secondary information. To formulate this paper the researchers used books, earlier published articles, conference papers, and numerous research reports.

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Metal-Free Indole–Phenacyl Bromide Cyclization: A Regioselective Synthesis of 3,5-Diarylcarbazoles

Sudipto Debnath, Tuluma Das, Tanmay K. Pati, Swapan Majumdar, and Dilip K. Maiti*

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A Task-Specific Ionic-Liquid-Mediated Solvent-Free Protocol for Direct Access to Dimethyl Acetal Protected Benzimidazole 2-Carboxaldehydes

Barnali Deb , Ankita Chakraborty , Jewel Hossain , Swapan Majumdar (http://orcid.org/0000-0001-7246-1875) *

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› Further Information

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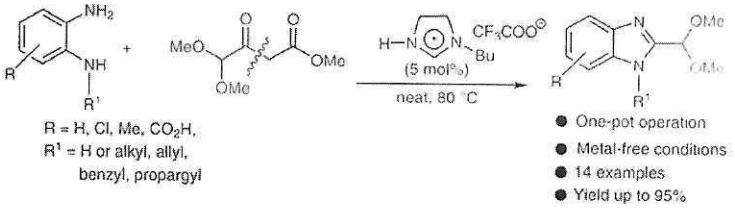

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Abstract

A robust and straightforward protocol has been developed for the synthesis of a diverse array of dimethyl acetal protected benzimidazole-2-carboxaldehydes by reacting various 2-amino aniline derivatives with methyl 4,4-dimethoxy-3-oxobutanoate using the task-specific imidazolium ionic liquid (HBIm·TFA) as a promoter for N-C/C-N annulation processes. The present protocol offers several advantages over existing protocols, such as single-step process, short reaction times, very mild reaction conditions, high yields, ease of purification, recovery and reusability of the catalyst, and scale-up of the reaction.

Key words

benzimidazole carboxaldehydes - dimethyl acetal - C–C bond cleavage - task-specific ionic liquid

Supporting Information

Supporting information for this article is available online at https://doi.org/10.1055/s-0040-1706391.
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Efficiency of Tourism Industry in Asian Countries - An Optimization Approach through DEA Frontier

DR. Basudeb Bhattacharya, Abhiroop Roy, +1 author Chinmoy Roy •

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As the unveiling beauty spot of leisure landscape is changing rapidly with the widespread and ongoing vicissitudes in tourism and hospitality management globally, this sector is now navigating a fine line between nature- based and nurture-built tourism which can contribute in any country's economic development. With the core issues of choices of new generation, destination promotion, marketing and smart city involvement, the majority of the countries are now going to adopt a long-term...
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Determinants of Social Exclusion: A Study on the Persons with Disabilities of Tripura in North East India

Solanki Debnath, Javanta Choudhury and Subhrabaran Das*

Persons with disabilities (PWDs) are among the most marginalised, impoverished section of society trapped in a vicious cycle of poverty, deprivation and social exclusion. Most of the PWDs are facing several barriers that limit their participation in mainstream societal activities, thereby leading a more or less secluded life. The present paper attempts to examine the socio-economic status of persons with disabilities. This paper also tries to examine the determinants of social exclusion in respect of persons with disabilities in the rural areas of Tripura. The study is based on primary data which is collected from all eight districts of Tripura. The socio-economic status is examined through the Social Exclusion Index which is composed of several social and economic parameters; and determinants of Social Exclusion are examined through multiple regression analysis. The study reveals that this marginalized section of rural Tripura is socially excluded in terms of socio-economic parameters. Income, poor educational status, marginalized cast category are the major determinants of social exclusion of disabled persons.

Keywords: *Persons with disabilities (PWDs), Types of disabilities, Social exclusion index, Determinants of social exclusion*

I. INTRODUCTION

Over the years, the concept of social exclusion has gained much popularity among the academicians, politicians, policy makers, and also in the official documents. The backdrop in which the concept originated is ambiguous and contradictory. Social exclusion is a process which involves lack or denial of resources, rights, good and services necessary to participate in social, economic, political and cultural activities and to enjoy a standard of living that is considered normal and available to the majority of people in the society (Levistas et. al., 2007).

Social exclusion is embedded in three paradigm viz; solidarity paradigm, specialization paradigm and monopoly paradigm. Each paradigm provides an

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AN INTERNATIONAL BILINGUAL PEER REVIEWED REFEREED RESEARCH JOURNAL

Men and Machine in the Context of Economic Viability : A Study of the Rickshaw Pullers of Agartala, India

Salim Shah*
Surajit Adhikari**

ABSTRACT

Development leads to growing mechanisation and replacement of manual works by machines. As in case of Agartala, the capital of Tripura, India, there has been a gradual transformation of the local transport system since the year 2013 where the half century old paddle rickshaws are facing increasing competition from its counterpart viz. E-rickshaws and motor rickshaws. The paddle rickshaws are now in a vulnerable condition regarding its employability, income generation and future prospect. Besides, the motor rickshaws have been banned by the Tripura High Court on the grounds of its unauthorised implementation and accident proneness. Therefore, the economic aspect of machine over men needs to be methodologically investigated. The present study carefully investigates economic viability, future prospects and the determinants of net income for various types of rickshaws in the city. For the purpose, a primary survey of the sample size, 90 has been conducted and the net income gain, benefit-cost ratio and linear regression techniques (with type of rickshaws as nominal variable, where paddle rickshaws as reference dummy) have been applied. The study concludes that paddle rickshaws are relatively economically non-viable and the factors like working capacity and type of rickshaws are significant causes behind. The E-rickshaws have appeared to be a feasible alternative public policy so far as employment, income generation and traffic environment are concerned.

Keywords : Rickshaws, Cost-Benefit, Economic Viability, Traffic Environment, Public Policy.

1. Introduction

Transport system evolves with human civilisation and develops across several stages like the stages of hunting, pastoral, agricultural, industrial and commercial. Men have made achievements in transport system which in turn helped civilization to develop. It becomes instrumental to spread development and mixing cultures. Rickshaw, being one of the oldest modes of transport is a part and parcel of our civilization. The word 'rickshaw' has originated in Japanese language which means a human powered vehicle. It evolves into various types over time from hand pulled to paddle rickshaw, then from paddle to motor rickshaw, to the latest addition of E-rickshaw (popularly known as tom-tom/tuk-tuk, is cost friendly with minimum charging cost, economically efficient with more as carrying capacity, environment friendly with zero carbon emission). Delhi High Court banned running of e-rickshaws in Delhi on 31 July 2014, over the safety concerns raised through a public litigation (The Hindu, New Delhi, 31 July, 2014). Though, in March, 2015, the Indian Parliament has passed an amendment to the Motor Vehicles (Amendment) Bill, 2015 legalizing E-Rickshaw. Rickshaw becomes an easy mode of local transport for passengers and goods. The evolvement of rickshaw has made the workload easier with higher efficiency and productivity, greater earnings for the pullers.

Agartala, the capital of Tripura has registered some major reforms in transport during the last two decades through introduction of railway connectivity from Agartala to Delhi and other parts of the country and within the state, transit route through Bangladesh. The

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AN INTERNATIONAL BILINGUAL PEER REVIEWED REFEREED RESEARCH JOURNAL

THE STATE OF REPRODUCTIVE AND CHILD HEALTH IN RURAL AREAS : A CASE STUDY OF TRIPURA, INDIA

Salim Shah*
Priyanka Bhowmik**

ABSTRACT

Reproductive health implies that people are able to have a responsible, satisfying and safe sex life and that they have the capability to reproduce and the freedom to decide, if when, and how often to do so. Reproductive and Child Health which comprises the health of Mothers (15-49), Children (0-5) and Adolescent girls (10-19) do have significant bearing on human capital formation and sustainable economic development of the society. Therefore, studying the status of RCH (Reproductive and Child Health) and households' behaviour to reproductive health has some crucial policy importance (Human Capital Theory of Becker, 1994). Covering a sample size of 300 households from 3 villages of South Tripura district of Tripura, Indi, the study tries to find out the socio-economic factors determining RCH status of a society. The study observes that effective public polices and their implementation are required towards poverty reduction; occupational redistribution; legal reinforcement of the tender age of marriage for girls; creating mass awareness for family planning, reproductive health, RTI/STI/HIV/AIDS, methods of contraception and maintenance of menstrual hygiene; and nutritional improvement for all the categories viz. women, children and adolescents.

Keywords : RCH, Rural, Tripura

1. Introduction

Reproductive health has emerged as a major issue in the international human rights agenda in recent times owing to the persistent advocacy of the women's organizations and government bodies around the world. Reproductive health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity, in all matters relating to the reproductive system and to its functions and processes. It also includes sexual health, the purpose of which is the enhancement of life and personal relations (WHO, 2008). The Millennium development Goals - 5 has aimed to improve maternal health with the objectives of reducing maternal mortality by three quarters and achieving universal access to reproductive health within a period of 25 years from 1990 to 2015 which has been reduced to only 56 per cent in rural areas.

Reproductive and Child Health (RCH) is a programme, taken by the Govt. of India in her Ninth Five Year Plan, following International Conference of Population Development, Cairo (1994) with Phase-I (1997) and Phase II (2005) comprising of NRHM (since 2005) and NUHM (since 2013) under National Health Mission to promote 'equity, efficiency, quality and accountability of public health services through community driven approaches, decentralization and improving local governance. Newborn and child health are now the two key pillars of the Reproductive, Maternal, Newborn, Child and Adolescent health (RMNCH+A) strategic approach, 2013. As per Planning Commission Estimates (2014), the incidence of rural poverty (30.09 percent) is higher than urban poverty (26.40 percent). This higher rural poverty gets well reflected through their lacks in health outcomes in terms

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ECONOMIC GROWTH RATES OF THE NORTH-EASTERN STATES OF INDIA- A NOTE

❒Rituparna Poddar*
Indraneel Bhowmik**

ABSTRACT

The present study examines the growth pattern of the 8 North-eastern states of India, which had been traditionally backward. The estimate and analysis of NSDP & PCNSDP growth rates indicate that Sikkim and Manipur lies at the two extreme in the long-term perspective (2000-01 to 2017-18), particularly because of their performance in the initial years. However, phase wise analysis indicates that Mizoram has been performing the best in the recent years while Meghalaya has dropped down Moreover, owing to differential population growth, the PCNSDP growth also varied across the states and with that of the NSDP. Adequate policy mix and infrastructure build-up are necessary for sustainable growth of these states.

Keywords : Growth, northeast, economy, NSDP, per-capita

Introduction

The north-eastern region (NER) of India, which stretches from foothills of Himalaya to the plains of Brahmaputra, comprises of eight states, namely Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura and is surrounded by Bangladesh in the south-west, Bhutan and China in the north, Myanmar in the east and Nepal to the west of Sikkim. The region extends over 262 179 Sq. Km thereby accounting for 7.9% of country's total geographical area and residence to 3.8% of the total population of India. 96% of the region's boundary shares international border and remaining 4% (Siliguri corridor) connects the region with mainland India. The region is known for its diversified cultures, customs, traditions and languages. Owing to the varying altitudes, the region experiences diverse agro-climatic conditions and hence is identified as a bio-diversity hot-spot.

After independence, the region remained almost neglected for a long time because of its isolated location, which was a consequence of partition of the country. However, for development of the region, North Eastern Council (NEC) was formed in the year 1971 as an advisory body, which was later sanctioned as a regional planning body in 2002, to take care of social and economic planning of the region. Further, Ministry of Development of North Eastern Region (DONER) was established in the year 2001 to deal with the matters related to socio-economic development of 8 states of NER. The region further, regained its strategic importance with the advent of "Look East Policy", which at a later phase, came to be known as "Act East Policy". Having shared 96% of its boundary with international border, the region offers a gateway to South-east Asian countries to foster economic and socio-cultural relation with them. Enhanced interaction with ASEAN in terms of trade and investment, science and technology and tourism is expected to solve the issue of poverty and unemployment in the region and would also prove to be beneficial for the development of the region in particular and country as a whole. As a consequence of such initiatives it was expected, in the Vision 2020 document

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Research Article

Modified Spider Monkey Optimization-Based Optimal Placement of Distributed Generators in Radial Distribution System for Voltage Security Improvement

Gagari Deb ✉, Kabir Chakraborty & Sumita Deb

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Abstract

Due to increase in load demand the use of distributed generation has been increased in the distribution system. Voltage profile as well as voltage security state of the distribution system can be improved by incorporating Distributed Generator (DG) of particular sizes at specific locations. In this article, modified spider monkey optimization (MSMO) technique has been proposed for finding out the optimal size and location of DGs to improve stability of the network. This method is a

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Vivaldi antennas: a historical review and current state of art

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Tutorial and Review Paper

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Vivaldi Antenna; dielectric director; fractal; metamaterial; microwave imaging

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Abstract

The progressions in the field of wireless technology can be highly attributed to the development of antennas, which can access high data rates, provide significant gain and uniform radiation characteristics. One such antenna called the Vivaldi antenna has attracted the utmost attention of the researchers owing to its high gain, wide bandwidth, low cross-polarization, and stable radiation characteristics. Over the years, different procedures have been proposed by several researchers to improve the performance of the Vivaldi antennas. Some of these different approaches are feeding mechanisms, integration of slots, dielectric substrate selection, and radiator shape. Correspondingly, the performance of a Vivaldi antenna can be increased by including dielectric lens, parasitic patch in between two radiators, corrugations, as well as metamaterials. This paper gives a systematic identification, location, and analysis of a large number of performance enhancement methods of Vivaldi antenna design depicting their concepts, advantages, drawbacks, and applications. The principal emphasis of this article is to offer an outline of the developments in the design of Vivaldi antennas over the last few years, where the most important offerings, mostly from IEEE publications, have been emphasized. This review work aims to reveal a promising path to antenna researchers for its advancement using Vivaldi antennas.

Introduction

As the demand for broadcast and wireless communication technologies is increasing day by day, the necessity of planning a new type of antenna with features like broader impedance bandwidth and highly directive radiation pattern has increased. Directional antennas are mostly used in applications to enhance the wireless systems' capacity and to reduce the effect of co-channel interference and multipath effects. Wideband antennas are used in different applications like satellite communication, RADAR, microwave imaging systems, remote-sensing systems, GPR detection, and medical applications. On the other hand, wideband antennas are also found useful in broadband communication to replace the need for multiple antennas for diversified applications due to its features like less complexity, lower power consumption, and a more compact footprint. Vivaldi antennas has been found as is one of the suitable candidates for a broadband directional communication system.

Gibson [1], in the year 1979, first introduced the Vivaldi Antenna, which belongs to the class of end-fire traveling antennas. The Vivaldi antenna offers the feature of a slot line in which edge separation of the slot line extends higher than $X/2$, where X is the length of the parameter. The non-resonant traveling wave mechanism of radiation of a Vivaldi antenna is produced by a higher-order Hankel function [1]. The main requirement for the gain of the Vivaldi antenna is that the bounded wave phase velocity should be equal to or exceed the surrounding medium, which needs a continuous phase leading compensation of the traveling wave structure. The Vivaldi antenna provides end-fire radiation with a beam width approximately the same for E- and H-planes. For achieving constant beam width, the shape of the antenna is ultimately expressed in terms of the wavelength, which is a dimensionless quantity. The video receiver module in [1] is designed using a Vivaldi antenna and an integrated broadband video detector unit. The designed curve is in the form used in Fig. 1 with $Y = \pm AePX$, where Y represents the distance of half separation and X means the length parameter. The magnification factor P determines the bandwidth. The radiating conductor slot plane of Vivaldi antenna is designed on an alumina substrate using the following equation [1].

$$Y = \pm 0.125 \exp(0.052X), \tag{1}$$

where X and Y represent dimensions to a new origin at the radiator feed.

Vivaldi antenna belongs to a class of a periodic, gradually curved slow leaky end-fire traveling antenna. The different portions of the antenna radiate different frequencies, but the size

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Fractal antennas and arrays: a review and recent developments

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Tutorial and Review Paper

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Fractal; antennas; multiband; wideband; UWB; antenna array

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Abstract

In mathematical definition, a fractal is a self-similar subset of Euclidean space whose fractal dimension strictly exceeds its topological dimension which in turn involves a recursive generating methodology that results in contours with infinitely intricate fine structures. Fractal geometry has been used to model complex natural objects such as clouds coastlines, etc., that has space-filling properties. In the past years, several groups of scientists around the globe tried to implement the structure of fractal geometry for applications in the field of electromagnetism, which led to the development of new innovative antenna configurations called "fractal antennas" which is primarily focused in fractal antenna elements, and fractal antenna arrays. It has been demonstrated that by exploiting the recursive nature of fractals, several marvellous kinds of properties can be observed in antennas and arrays. The primary focus of this article is to provide a compressed overview of the developments in fractal-shaped antennas as well as arrays over the last few decades where the most prominent contributions mostly from IEEE journals have been highlighted. The open intention of this review work is to show an encouraging path to antenna researchers for its advancement using fractal geometries.

Introduction

Benoit Mandelbrot (1924–2010) was a French and American mathematician (Fig. 1) who referred himself as "fractalist" [1] and is well recognized for his contribution to the field of fractal geometry, who coined the word "fractal" and developed the theory of "roughness and self-similarity" in nature. As a visiting professor at Harvard University, Mandelbrot began to study fractals called "Julia sets" based on previous work by Gaston Julia and Pierre Fatou. In 1982, he expanded his ideas in "The Fractal Geometry of Nature" [1] which brought fractals into the mainstream of professional and popular mathematics. His informal and passionate style of writing and his emphasis on visual and geometric intuition made "The Fractal Geometry of Nature" accessible to non-specialists which sparked widespread interest in fractals which is acceptable in almost every field from finance to physics to medicine.

In the study of fractal structures, geometric series often arise as the perimeter, area, or volume of a self-similar structure. For example, the area of Koch snowflake [1] can be described as the union of infinitely many equilateral triangles (Fig. 2). Here, each side of the green triangle is exactly 1/3 the size of a side of the large blue triangle, and therefore has exactly 1/9 of the area. Similarly, each yellow triangle has 1/9 of the area of a green triangle, and so forth. Taking the blue triangle as a unit of area, the total area of the snowflake can be calculated as:

$$1+3\left(\frac{1}{9}\right)+12\left(\frac{1}{9}\right)^2+48\left(\frac{1}{9}\right)^3+\ldots\ldots \tag{1}$$

The first term of this series represents the area of the blue triangle, the second term represents the total area of the three green triangles, the third term represents the total area of the 12 yellow triangles, and so forth. Excluding the initial 1, this series is geometric with constant ratio $r = 4/9$. The first term of the geometric series is, $a = 3(1/9) = 1/3$, so the sum is:

$$1+\frac{\frac{1}{3}}{1-\frac{4}{9}}=\frac{8}{5}. \tag{2}$$

Thus, the Koch snowflake has 8/5 of the area of the base triangle leading to convergent series formulation.

Also, perturbation theory can be used efficiently to obtain a prescription that recursively generates the structure of the abstract attracter. This technique can be used in the calculation of the fractal dimension of the attracter of certain two- or three-dimensional maps. Presently, significant attention is being paid for characterizing the deterministic chaotic behavior of dynamic

Indian Journal of Traditional Knowledge (IJTK)

Traditional healing practices of Pnar and War communities in West Jaintia Hills District of Meghalaya, Northeast India

Debnath, B ; Langshiang, A S; Debnath, A ; Bhattacharjee, A ; Paul, C

Abstract

Pnar and War are the most predominant and oldest ethnic community in the West Jaintia Hills of Meghalaya; they have faith on the medicinal plants for their primary health care. Information about the ethno medicinal uses of several plants were collected through interview of the local respondents following the standard ethno medicinal methods. Statistical tools, informant consensus factors (F_{IC}) and fidelity level (FL) were used to analyze the importance of ethnomedicinal plants. The present investigation revealed 70 plant species belong 64 genera, under 44 family were being used against different ailments, which were classified into 11 groups. The results of the F_{IC} value of blood related disease category had the greatest agreement =1.0), followed by Urinogenetal disease (0.90), Antidote (0.85), Dermatological, fungal and bacterial infections (0.82). The highest FL values were gastrointestinal, parasitic and hepatobiliary (*Melastoma malabathricum*, 95.83%), followed by external injuries and bleeding (*Centella asiatica*, 94.11%), oral, dental and otorhinolaryngolgical problems (*Curcuma longa*, 91.66%).

Keyword(s)

Ethnomedicine; F_{IC} value; FL level; Jaintia; Pnar and War; Traditional healers

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Throughfall and stemflow nutrient flux in deodar and oak forests, Garhwal Himalaya, India

Purna Jana, Sabyasachi Dasgupta and Nagendra P. Todaria

ABSTRACT

A study to understand the throughfall and stemflow chemistry under deodar and oak forests of Garhwal Himalaya was conducted during 2014–2015. Total rainfall during experimental period was 1473.8 mm and estimated interception loss was 34.018% for deodar forest, 24.85% for oak forest. Stemflow represented the minimum proportion of gross rainfall, i.e. 0.321% in deodar forest and 0.463% in oak forest. pH of throughfall and stemflow in both deodar (6.087 and 6.47 respectively) and oak forests (6.75 and 7.03 respectively) was significantly more acidic than the gross rainfall (7.15). Electrical conductivity was recorded higher in deodar stemflow (231.89 μS/cm) and throughfall (102.75 μS/cm) compared to oak forest (172.92 μS/cm and 83.83 μS/cm respectively). Net nutrient leaching and stemflow were considerably higher from oak forest than deodar forest. Oak forest has better water yield capacity than deodar forest as the interception loss was higher in deodar forest. The idea of sustainable agriculture may be possible surrounding such forests as the need for chemical fertilizer and water can be met by the nutrient-rich soil, available soil moisture and surface water.

Key words | deodar, ecosystem service, hydrological flux, nutrient deposition, oak

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HIGHLIGHTS

- Oak forest has better water yielding and nutrient deposition capacity than deodar forest.
- Climate and its changing condition have influence on rainfall partitioning.
- Precipitation input plays significant role in nutrient cycling.
- Sustainable agriculture may be possible around such forests as the need for chemical fertilizer and water can be met by nutrient-rich soil, available soil moisture and surface water.

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In Agartala, Tripura, India, the road network has significantly developed over the years. This study focuses on the characteristics namely carriageway, footpath, number of lanes and roadside amenities of important east-west and north-south aligned roads, which determine the nature of traffic movement in the Agartala Municipal Corporation. The study is based on extensive field work on the level of intra-urban transport network development in the city. It reflects the presence of inadequate carriageway width, absence of footpath and sufficient roadside amenities, which results in frequent traffic bottlenecks and congestion in the city streets.

Road density of Agartala... | Selected east-west and north-... | Roadside amenities along... | Vehicle density of selected roads i...

RESEARCH ARTICLES

Assessment of the road characteristics of selected north–south and east–west aligned

Geographical Review of India **82** (4) December - 2020, 348- 367

Determinants of Urban Footpaths and Impact on Quality and Mobility Mapping: A Study in Agartala City

Saptarshi Mitra[a*], Debasish Debbarma[b] and Stabak Roy[a]

Abstract : *The footpaths is a type of pathway intended for use only by pedestrians who feel free to walk smoothly until various determinants hinder them. As a smart city, Agartala needs good footpaths for smooth mobility that are lacking at present. Moreover, the existing footpaths are too plagued with various problems. For this purpose, the present research work analyses the quality and quantity of footpaths in thecity and secondly identify the footpaths' significant obstacles, which influenced Agartala City's mobility. For urban transport planning, it is necessary to study the morphology of the urban footpaths as well as their significant obstacles footpaths. For the foundation of the research paper and to spot the features, scheduled surveys have been taken out on footpaths areas to find the actual problems. Index of satisfaction and statistical methods are also used in analyses the problem with logical elucidation. The study reveals thatAgartalaCity's footpaths is inadequate, insufficient, and less accessible and does not provideasafe and smooth tract to the common people to walk. As a result, pedestrians are compelled to walk partially on roads resulting to the slow movement of vehicles, delay during the rush hour, traffic congestions and road accidents.It is proposed that a proper infrastructural planning of footpaths is one alternative solution to minimize the existing problems being faced by the pedestrian of Agartala City.*

Key Words: *footpaths, mobility, pedestrian, road infrastructures, street vendors.*

Introduction

Footpaths may be defined as a path for people to walk in a built-up area of an urban centre and no other forms of traffic such as motor vehicles or non-motorized vehicles are allowed through it. Footpaths are usually paved and sometimes may have stepped in the fringe end ward. The Footpaths play an important role in an urban road network system which provides a safe track for people to walk. Generally, they are separated from roads. Footpaths help easy access for all, especially to the children and old aged persons.

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भारत की सांस्कृतिक अस्मिता और जातीय सभ्यता की संवाहिका संस्कृत

• विनोद कुमार मिश्र

सदियों से संस्कृत भाषा भारत की राष्ट्रीय अस्मिता की आधारशिला व प्राणवायु रही है। प्रायः सभी राष्ट्र अपनी सांस्कृतिक ऊर्जा को अपने देश की शास्त्रीय भाषाओं से सक्षम बनाते हैं। संस्कृत भारत की एकमात्र शास्त्रीय भाषा है, जिसने भारतीय मनीषा को उदात्त और उदग्रीव बनाया और पूरा विश्व भारतीय मनीषा का ऋणी बना। वेद, आगम-निगम-पुराण, उपनिषद्, रामायण, महाभारत, गीता, व्याकरण, आयुर्वेद, ज्योतिष, गणित, खगोल विज्ञान, अर्थशास्त्र, धर्मशास्त्र, न्यायशास्त्र, रसशास्त्र, कामशास्त्र, वास्तुशास्त्र सहित अनेक उत्कृष्ट महाग्रंथों का प्रणयन दुनिया की सबसे वैज्ञानिक और सक्षम देवभाषा संस्कृत में हुआ। ये ग्रंथ भारतीय मनीषा के अनवरत चिंतन और मनन के सुपरिणाम हैं। भारत द्वारा इन ग्रंथों के रूप में संपूर्ण विश्व जन-मन को दी जाने वाली अब तक की श्रेष्ठतम सौगात है। जैसा कि हम सभी जानते हैं कि हर कृति के मूल में राष्ट्र की हित चिंता रही है। समाज इतिहास, भाषा, संस्कृति, परंपरा और विचार के पंच नद से ही संस्कृत की रचनात्मक धारा का प्रवाह सदियों से प्रवाहित होता रहा है। इन धाराओं को हमेशा किसी न किसी भगीरथ की प्रतीक्षा रहती है, ताकि उन्हें सौंप कर अपने कर्तव्य व दायित्व के अनुपालन से मुक्त हो सकें। फिर आगे का दायित्व निर्वहन संस्कृत के भगीरथ को करना होगा, फिर भगीरथ उस धारा को अक्षुण्ण बनाते हुए संस्कृति और भारतीय सभ्यता के गंगा के प्रवाह को निरंतरता प्रदान करेंगे। माँ भारती का दुर्भाग्य रहा कि हम भगीरथों ने उस माँ की परवाह किए बगैर उसकी धारा को सूख जाने दिया।

संस्कृत भाषा शिक्षा की मजबूत बुनियाद रखती है और एक नए युग में प्रवेश कराती है। यह भाषा मात्र विचारों को आगे नहीं ले जाती, वरन् वह स्वयं संस्कृति के निर्माण में महत्त्वपूर्ण भूमिका निभाती है, जातीय सभ्यता का प्रतीक गढ़ती है और सामाजिक चेतना का विराट् सांस्कृतिक इतिहास भी लिखती है तथा शिक्षित कर मानव-मुक्ति का मार्ग प्रशस्त करती है—'सा विद्या या विमुक्तये' का स्वर मुखरित कर राष्ट्र-निर्माण में अपनी महत्त्वपूर्ण भूमिका का निर्वाह करती है व जातीय सभ्यता की सार्वभौमिक पहचान बनाने का मार्ग भी प्रशस्त करती है। संस्कृत की

सुपरिचित लेखक-अध्यापक। अब तक ५ पुस्तकें, ३० आलेख प्रकाशित। पूर्व में प्रोफेसर एवं अध्यक्ष, हिंदी विभाग, त्रिपुरा केंद्रीय विश्वविद्यालय। २० राष्ट्रीय व १२ अंतरराष्ट्रीय संगोष्ठी, सम्मेलन, २० कार्यशाला विभिन्न विषयों पर। विभिन्न विश्वविद्यालयों/संस्थाओं की अकादमिक समितियों के सदस्य। संप्रति महासचिव, विश्व हिंदी सचिवालय, मॉरीशस।

कड़ाही में पककर कुंदन बन भारतीय शिक्षा मृण्मय से चिन्मय की यात्रा कराती है। संस्कृत ऐसी ही भाषा है, जो मानव मात्र को चिन्मय बनाती है और हाँ, किसी भी भाषा का आधार केवल भाषाई संप्रेषण और उसकी रचना की समसामयिकता से नहीं बनता। भाषा के सांस्कृतिक आधार की गौरवशाली परंपरा की निर्मिति ऋषियों द्वारा अनवरत की गई तपश्चर्या व साधना की देन होती है और संस्कृति की संरचना के पीछे सांस्कृतिक परंपरा की सर्जनात्मक शक्ति पूरी सक्रियता के साथ खड़ी रहती है। भाषा की शक्ति, संप्रेषण व शिक्षा के व्यावहारिक विस्तार भाषा को राष्ट्रीय परिप्रेक्ष्य में सर्वोच्च स्थान प्रदान करते हैं। संस्कृत ने तमाम विघ्न-बाधाओं के बावजूद हजारों वर्षों की ऐतिहासिक यात्रा में संप्रेषण से शास्त्रीय भाषा तक की यात्रा में उपलब्धियों के कई महत्त्वपूर्ण मानकों का निर्माण तो किया ही है, साथ ही मजबूत बंधन का भी निर्माण किया है, जो अनंत काल तक राष्ट्र को बिखरने व टूटने के खतरे से बचाते हुए एक सूत्र में बाँधकर रखने की शक्ति से सुसंपन्न बनाया है। संस्कृत कवच बन समूची मानवता को वैचारिक पराधीनता से मुक्त भी कराने की शक्ति रखती है। हम यह जानते हैं कि सांस्कृतिक पराधीनता राष्ट्र को खंड-खंड कर देती है और खंडित राष्ट्रीयता भाषा और शिक्षा को नहीं बचा सकती है। भाषा से शिक्षा और शिक्षा से संस्कृति बचेगी, फिर संस्कृति की मदद से राष्ट्र को अचल और अटल बनाए रखने से कोई रोक नहीं सकता। अतः हर हाल में संस्कृत भाषा के संरक्षण व संवर्धन की दिशा में सार्थक पहल की जानी ही चाहिए और स्वभाव के स्तर पर, संस्कार के स्तर पर और चिंतन

Review J Biochem Mol Toxicol. 2021 Feb;35(2):e22643. doi: 10.1002/jbt.22643
Epub 2020 Sep 29

Understanding the complicated relationship between antioxidants and carcinogenesis

Debabrata Majumder [1], Priyatosh Nath [1], Rahul Debnath [1], Debasish Maiti [1]

Affiliations
PMID: 32996240 DOI: 10.1002/jbt.22643

Abstract

Reactive oxygen species (ROS) are generated as by-product of cellular respiration and also due to the exposure of various xenobiotics, whereas mitochondrial electron transport chain is considered as the main source of ROS generation. The sequential addition to molecular oxygen gives rise to various forms of ROS like superoxide anion, peroxide, hydroxyl radical, hydroxyl ion, and so forth. However, the uncontrolled level of ROS generation and accumulation alters the body homeostasis. Excessive generation of ROS leads to oxidative stress and various kinds of diseases including cancer. To counteract ROS, enzymatic and nonenzymatic antioxidants' armory is available in our body. Apart from endogenous antioxidants, we are also consuming various exogenous antioxidants. Antioxidants protect us from ROS-mediated damages and inhibit ROS-induced carcinogenesis. Recent studies have revealed that antioxidants could also act as tumor-promoting agents. Various anticancer drugs are used to kill the cancer cells through the generation of oxidative stress in them, but the cancer cells can counteract the effect with the help of various endogenous as well as exogenous antioxidants. Our review will summarize the multifaceted relationship between antioxidants and carcinogenesis, and it will help to create new directions in antioxidant-based chemotherapy.

Keywords: Nrf2; ROS; antioxidants; carcinogenesis; oxidative stress; p53.

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Folia Microbiol (Praha). 2021 Apr;66(2):255-271. doi: 10.1007/s12223-020-00841-1. Epub 2021 Jan 7

Attenuation of Pseudomonas aeruginosa biofilm by thymoquinone: an individual and combinatorial study with tetrazine-capped silver nanoparticles and tryptophan

Poulomi Chakraborty [1], Payel Paul [1], Monika Kumari [2], Surajit Bhattacharjee [3], Mukesh Singh [4], Debasish Maiti [5], Debabrata Ghosh Dastidar [6], Yusuf Akhter [7], Taraknath Kundu [8], Amlan Das [9], Prosun Tribedi [10]

Affiliations
PMID: 33411249 DOI: 10.1007/s12223-020-00841-1

Abstract

Microbial biofilm indicates a cluster of microorganisms having the capability to display drug resistance property, thereby increasing its proficiency in spreading diseases. In the present study, the antibiofilm potential of thymoquinone, a black seed-producing natural molecule, was contemplated against the biofilm formation by Pseudomonas aeruginosa. Substantial antimicrobial activity was exhibited by thymoquinone against the test organism wherein the minimum inhibitory concentration of the compound was found to be 20 µg/mL. Thereafter, an array of experiments (crystal violet staining, protein count, and microscopic observation, etc.) were carried out by considering the sub-MIC doses of thymoquinone (5 and 10 µg/mL), each of which confirmed the biofilm attenuating capacity of thymoquinone. However, these concentrations did not show any antimicrobial activity. Further explorations on understanding the underlying mechanism of the same revealed that thymoquinone accumulated reactive oxygen species (ROS) and also inhibited the expression of the quorum sensing gene (lasI) in Pseudomonas aeruginosa. Furthermore, by taking up a combinatorial approach with two other reported antibiofilm agents (tetrazine-capped silver nanoparticles and tryptophan), the antibiofilm efficiency of thymoquinone was expanded. In this regard, the highest antibiofilm activity was observed when thymoquinone, tryptophan, and tetrazine-capped silver nanoparticles were applied together against Pseudomonas aeruginosa. These combinatorial applications of antibiofilm molecules were found to accumulate ROS in cells that resulted in the inhibition of biofilm formation. Thus, the combinatorial study of these antibiofilm molecules could be applied to control biofilm threats as the tested antibiofilm molecules alone or in combinations showed negligible or very little cytotoxicity.

Related information

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Review Curr Pharm Biotechnol. 2022;23(2):261-275.
doi: 10.2174/1389201022666210412143553.

Olive Oil Consumption can Prevent Non-communicable Diseases and COVID-19: A Review

Debabrata Majumder [1], Mousumi Debnath [2], Kamal Nayan Sharma [3], Surinder Singh Shekhawat [4], G B K S Prasad [5], Debasish Maiti [1], Seeram Ramakrishna [6]

Affiliations
PMID: 33845735 DOI: 10.2174/1389201022666210412143553

Abstract

The Mediterranean diet is appraised as the premier dietary regimen, and its espousal is correlated with the prevention of degenerative diseases and extended longevity. The consumption of olive oil stands out as the most peculiar feature of the Mediterranean diet. Olive oil rich in various bioactive compounds like oleanolic acid, oleuropein, oleocanthal, and hydroxytyrosol is known for its antiinflammatory as well as cardioprotective property. Recently in silico studies have indicated that phytochemicals present in olive oil are a potential candidate to act against SARS-CoV-2. Although there are many extensive studies on olive oil and its phytochemical composition, however, some lacunas persist in understanding how the phytochemical composition of olive oil is dependent on upstream processing. The signaling pathways regulated by olive oil in the restriction of various diseases are also not clear. For answering these queries, a detailed search of research and review articles published between 1990 to 2019 were reviewed. Olive oil consumption was found to be advantageous for various chronic non-communicable diseases. Olive oil's constituents are having potent anti-inflammatory activities and thus restrict the progression of various inflammation-linked diseases ranging from arthritis to cancer. But it is also notable that the amount and nature of the phytochemical composition of household olive oil are regulated by its upstream processing, and the physicochemical properties of this oil can give a hint regarding the manufacturing method as well as its therapeutic effect. Moreover, daily uptake of olive oil should be monitored as excessive intake can cause body weight gain and a change in the basal metabolic index. So, it can be concluded that the olive oil consumption is beneficial for human health, and particularly for the prevention of cardiovascular diseases, breast cancer, and inflammation. The simple way of processing olive oil is to maintain the polyphenol constituents, whichprovide the protection against noncommunicable diseases and SARS-CoV-2.

Keywords: Bioactive; cancer; cardiovascular; oleic acid.; oleuropein; olive oil.

Related information

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Life Sci. 2020 Jun 1;250:117560. doi: 10.1016/j.lfs.2020.117560. Epub 2020 Mar 17.

Dietary calcium regulates the insulin sensitivity by altering the adipokine secretion in high fat diet induced obese rats

Sandeep Das [1], Dipayan Choudhuri [2]

Affiliations
PMID: 32198054 DOI: 10.1016/j.lfs.2020.117560

Abstract

Aims: Dietary calcium a common nutrient of our daily diet found to have an anti-obesity effect which may also regulate insulin sensitivity but this effect and the exact mechanism remains unexplored. Therefore, we aimed to study the effect of different types of calcium diet on insulin sensitivity with respect to the changes in the adipokine secretions in high fat diet (HFD) induced obese rats.

Main methods: Healthy male rats were subjected to HFD for 12 weeks to induce obesity and further exposed to a calcium deficient (0.25% Ca) HFD and calcium enriched (1.0% Ca) HFD for another 12 weeks. Thereafter, all rats were sacrificed to collect the blood, liver, adipose tissue and muscle for downstream analysis.

Key findings: Calcium enriched HFD (1.0% Ca) significantly reduced ($p < 0.01$) body weight, adiposity index, glucose level, insulin level, HOMA-IR, adipokines (TNF-α, IL-6, MCP-1, Leptin), hepatic lipid accumulation, hepatic macrophage infiltration, adipocyte hypertrophy and significantly increased ($p < 0.01$) the adiponectin level, in HFD induced obese rats. The down-regulation of the adipokine secretion significantly increased ($p < 0.01$) the hepatic and muscle glycogen synthase activity and suppressed the hepatic gluconeogenesis activity via activating the insulin receptor-mediated PI3K/AKT/GLUT insulin signaling pathway thereby improving the insulin sensitivity. On the other hand calcium deficient HFD (0.25% Ca) accelerated the risk of insulin resistance (IR) due to its inability to improve insulin sensitivity by activating the associated pathways.

Significance: Calcium enriched HFD (1.0% Ca) reduced the risk of IR by improving the hepatic and muscle insulin sensitivity by restoring adipokine secretion.

Keywords: Adipokine; Calcium; Inflammation; Insulin resistance; Obesity.

Related information

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Review J Food Biochem. 2021 Apr;45(4):e13697. doi: 10.1111/jfbc.13697. Epub 2021 Mar 10.

Role of dietary calcium and its possible mechanism against metabolic disorders: A concise review

Sandeep Das [1], Dipayan Choudhuri [1]

Affiliations

PMID: 33694258 DOI: 10.1111/jfbc.13697

Abstract

The global prevalence of metabolic disorders including hypertension, dyslipidemia, insulin resistance, nonalcoholic fatty liver, and cardiovascular diseases seemed to affect people of all ages cutting across the national, economic, and demographic barrier. Therefore, the prevention of metabolic disorders is considered of paramount importance. The dietary role of nutrients including vitamins and minerals is one of the recommended preventive measures against metabolic disorders in modern society. Recently, dietary calcium, a common nutrient not only showed a beneficial effect against obesity through weight management, but also gained great attention against the risk of metabolic disorders. Though dietary calcium shows several beneficial effects against metabolic disorders but some inconsistent results were also reported. So, the present review aims to extract recent knowledge as well as their possible underlying mechanisms regarding the role of dietary calcium against metabolic disorders. The present review also discusses the negative impact as well as prospect of calcium intake on health issues. In summary, high calcium diet prevents the harmful consequences of metabolic disorders by regulating hormonal actions, alteration in intracellular calcium level, renin-angiotensin system, intestinal fat absorption, fecal fat excretion, lipid metabolism, carbohydrate metabolism, inflammation, and oxidative stress which together improve the metabolic health of an individual. PRACTICAL APPLICATIONS: Metabolic disorder is a global health issue across all sections of society and is growing rapidly in spite of several attempts by the scientific community to prevent it. Recently dietary calcium gained great attention in the last few years for its role in the management and treatment of metabolic disorders. The current review highlights the beneficial role of dietary calcium against several metabolic complications by exploring their underlying mechanisms at cellular level. This study will provide valuable information regarding the recommendation of dietary calcium in health policy as well as its inclusion in the dietary chart through calcium-rich foods and/or taking calcium supplements which can be a useful approach in preventing the risk of metabolic disorder depending on the health status of an individual.

Keywords: calcium; dyslipidemia; hypertension; insulin resistance; nonalcoholic fatty liver diseases.

Related information

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Toxicol Ind Health. 2020 Jul;36(7):487-501. doi: 10.1177/0748233720937196. Epub 2020 Jul 16.

Metabolic adaptability in liver and gastrocnemius muscle of mice following subacute lead toxicity

Pritha Das [1], Sudipta Pal [1], Surochita Basu [2]

Affiliations
PMID: 32672100 DOI: 10.1177/0748233720937196

Abstract

Lead (Pb) is one of several environmental pollutants that adversely affect human health by producing toxicity at the tissue level. The aim of the study was to understand the effects of Pb on the metabolic profiles of liver and gastrocnemius muscle of mice in relation to carbohydrate and fat metabolisms. Swiss albino mice were chosen and divided into two groups, control and Pb-treated. The Pb-treated animals were exposed to Pb at a dose of 5 mg/kg body weight for 30 days orally, which resulted in hypoglycemia, glycosuria, and increased glycogenolysis in the liver and gastrocnemius muscle of treated mice. Pyruvic acid, the end product of glycolysis decreased in muscular tissue and increased in the liver. Additionally, the activity of G-6Pase was depressed in the liver, whereas lactate dehydrogenase activity was increased in skeletal muscle only. An adaptive mechanism was initiated by stimulating glycogenolytic and retarding glycolytic activity in the liver and also by alteration of liver and muscle pyruvate dehydrogenase activity along with increased activity of malate dehydrogenase in skeletal muscle. There was enhancement of succinate dehydrogenase and nicotinamide adenine dinucleotide phosphate oxidase activities in the studied tissues. Interestingly, cholesterol, high-density lipoprotein, and low-density lipoprotein levels were elevated, whereas those of triglycerides were decreased in Pb-treated mice serum. The activities of fatty acid synthase and glyceraldehyde 3 phosphate dehydrogenase were depressed in Pb-treated mice livers. Pb also significantly altered the morphological features of the liver, skeletal muscle, and pancreas. These data suggested that subacute Pb exposure was responsible for metabolic modulation in an adaptive fashion in the liver and skeletal muscle of mice.

Keywords: Lead; TCA cycle; fatty acid synthesis; glycolysis; glycosuria; lipid profile; tissue morphology.

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In memory computation using quantum-dot cellular automata

Author(s): Mrinal Goswami [1, 2] ; Jayanta Pal [3] ; Mayukh Roy Choudhury [2] ; Pritam P. Chougule [4] ; Bibhash Sen [2]
View affiliations

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Article

The conventional computing system has been facing enormous pressure to cope with the uprising demand for computing speed in today's world. In search of high-speed computing in the nano-scale era, it becomes the utmost necessity to explore a viable alternative to overcome the challenges of the physical limit of complementary-metal-oxide-semiconductor (CMOS). Towards that direction, the processing-in-memory (PIM) is advancing its importance as it keeps the computation as adjacent as possible to memory. It promises to outperform the latencies of the conventional stored-program concept by embedding storage and data computation in a single unit. On the other hand, the bit storing and processing capability of Akers array provides the foundation of PIM. Again, quantum-dot cellular automata (QCA) emerges as a promising nanoelectronic to put back CMOS to give fast-paced devices at the nanoelectronics era. This work presents a novel PIM concept, embedding Akers array in QCA to achieve high-speed computing at the nano-scale era. QCA implementation of universal logic utilizing Akers array signifies its processing power and puts forth its potentials. A universal function is considered for testing the effectiveness of the proposed PIM cell. The performance evaluation indicates the efficacy of QCA PIM over the conventional Von Neumann architecture.

Inspec keywords: memory architecture; nanoelectronics; cellular automata; quantum dots; logic circuits; logic design; electronic engineering computing; logic arrays; CMOS memory circuits; digital arithmetic; VLSI

Other keywords: single PIM array; Akers logic array; arithmetic functions; processing-in-memory concept; CMOS; universal logic; processing-in-storage; quantum-dot cellular automata; processing power; QCA PIM; functional correctness; in-memory computing; QCAPro simulator; data computation; complementary metal-oxide-semiconductor; memory computation; bit storing; nanoelectronics era; nanoscale era; very large-scale integration; high-speed computing paradigm; Von Neumann architecture; stored-program concept

Subjects: Memory circuits; CMOS integrated circuits; Automata theory; Digital circuit design, modelling and testing; Logic circuits; Semiconductor storage; Logic design methods; Logic and switching circuits; Electronic engineering computing

Related content

Design of non-restoring binary array divider in quantum-dot cellular automata

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29

RESEARCH ARTICLE

WILEY

RPCP-MAC: Receiver preambling with channel polling MAC protocol for underwater wireless sensor networks

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Summary

To design a reliable and energy efficient medium access control (MAC) protocol for underwater wireless sensor networks (UWSNs) is an active research area due to its variety of applications. There are many issues associated with underwater acoustic channels including long and variable propagation delay, attenuation, and limited bandwidth which pose significant challenges in the design of MAC protocol. The available sender-initiated asynchronous preamble-based MAC protocols for UWSNs are not reliable and energy-efficient. This is due to the problems caused by transmission of preambles for longer duration and collision of preambles from hidden nodes in sender-initiated preamble-based MAC protocols. To resolve these issues, the paper proposed an asynchronous receiver-initiated preamble-based MAC protocol named Receiver Preambling with Channel Polling MAC (RPCP-MAC) protocol for shallow underwater monitoring applications with high data rates. The protocol is proposed to resolve data packet collision and support reliability in an energy-efficient way without using any transmission schedule. The proposed protocol is based on the following mechanisms. Firstly, receiver preambling mechanism is adopted to reduce idle listening. Secondly, channel polling mechanism is used to determine missing data frame during its sleeping period and to minimize the active time of node and reduces energy wastage. Finally, a back-off mechanism is applied to resolve collision when preambles are received simultaneously. In addition, performance analysis through Markov chain together with its validation with simulation-based studies is reported in the paper. Both the analytical and simulation results have demonstrated the reliability achievable with RPCP-MAC while providing good energy efficiency.

KEYWORDS

energy efficiency, MAC protocol, reliability, RPCP-MAC, underwater sensor networks

1 | INTRODUCTION

In recent years, underwater wireless sensor networks (UWSNs) have attracted attention because of their wide range of applications, including disaster prevention, mine reconnaissance, equipment monitoring and control, environmen-

RPCP-MAC is an asynchronous receiver initiated preamble based MAC protocol for Underwater Wireless Sensor Networks.

26/4/22
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Evolution Of Constitutionalism In Asia: A Comparative Study

Brij Mohan Pandey

Abstract:

This article traces the constitutional development in three major Asian nations— India, Japan, and China. It considers whether constitutionalism in its Western form may be regarded as having universal appeal and application far beyond the Western nations in which it originated, and whether it may be argued that there exists a distinctly Asian form of constitutionalism or of political-constitutional practices. Adopting a macro historical and comparative perspective on developments in these three nations, from the late nineteenth century till the present, the article demonstrates that constitutionalism has significantly broadened and deepened its reach in Asia in modern and contemporary times. It also suggests that no distinctly Asian mode of constitutionalism or of political-constitutional practices can be identified. Nor is there evidence that Asian culture and values are particularly resistant to constitutionalism. On the contrary, there is evidence that whether constitutionalism eventually triumphs in a particular jurisdiction is determined more by politics and the contingency of historical events, such as wars and foreign interventions, than by culture, values and customary practices.

Keywords: constitutionalism, judicial review, rule of law, separation of power, civil liberties,secularism, equality of law

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Authorship and Collaboration Pattern of Research Output Published by Researchers of Tripura University during 2010-2019: A Scientometric

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Save all to author list

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Abstract

The present paper is a scientometric enquiry of research publications of Tripura University for a period of 10 years (i.e. from 2010-2019) and based on the secondary data collected from Web of Science databases and found that the total 503 papers published during this study period which index in web of science database. The study endeavours to analyse the pattern of publications, annual growth in publications, authorship pattern, types of documents, collaboration patterns, collaborative index, collaboration coefficient, modified collaboration coefficient, prolific author etc. based on collected data and found that 2017 and 2019 were the most productive year for this university with 84 (16.7%) publications. The maximum documents published during the study period are in the form of research article 445(88.46%). Bhattacharjee, D and Hussain S,A was the top most prolific authors having 68 and 62 publications respectively and Jadavpur University has highest collaboration with Tripura University having 48 publication which is 9.54% of total publications. © 2020, Library Philosophy and Practice (e-journal). All rights reserved

Author keywords

Authorship Pattern; Bibliometric; Publication Pattern; Research Productivity; Tripura University

26/4/22

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Synthesis and Characterization of Superabsorbent Cellulose-Based Hydrogel for Agriculture Application

*Dipankar Das, Priyambada Prakash, Prasanta K. Rout, and Sachin Bhaladhare**

Hydrogels are 3D network formed by linear (or branched) hydrophilic polymer molecules that are chemically or physically crosslinked. Hydrogels can absorb a prominent amount of water and biological fluids and release them at a controlled rate. This study deals with the synthesis and characterization of carboxymethyl cellulose sodium salt (CMCNa) and hydroxyethyl cellulose (HEC)-based biodegradable hydrogels using citric acid (CA) as a crosslinker. The chemical analysis of synthesized hydrogels is performed using Fourier transform infrared spectroscopy. The cellulose nanocrystals (CNCs) are synthesized by an acid hydrolysis process and are incorporated into the hydrogel matrix and the effects of CNCs on hydrogel properties are assessed. The effects of the CA on hydrogels swelling properties are also studied and about 600% swelling is observed for the hydrogel synthesized using 2% of the CA crosslinker. Using CNCs as reinforcing agents for hydrogel composites decreases the tensile strength of hydrogels because of poor CNC dispersion within the hydrogel matrix is observed that can be seen in the scanning electron microscope images. The optimum use of crosslinkers and proper distribution of CNCs in the hydrogel matrix can provide a promising hydrogel material that can absorb and release water in a controlled manner to improve utilization of available water resources for agricultural applications.

1. Introduction

The agriculture sector is heavily dependent on water resources which have been gravely affected by the drought situation in India, and the climate change could be one of the reasons for rain deficiency. Unavailability of sufficient water for irrigation, loss of fertilizers, and increasing food demand requires proper management of water to conserve moisture and to increase water-holding capacity of the soil. The development of superabsorbent hydrogels will have a substantial effect in handling drought regarded area in India.[1–3] A hydrogel is a 3D crosslinked network structure of polymer chains and it works as a water reservoir around the roots of the plants. In the presence of water, the hydrogel swells to around 200–800 times its original volume. Because of this characteristic of the hydrogel, there is a sizable possibility to trap irrigation and rainwater that can be collected, stored, and gradually released (through diffusion process) for crop necessities over a sustained length. Hydrogels mixed with soil enhance soil permeability, is compatible with a broad range and type of soils, and thus increase plant performance and yield.[4–6] In hydrogels, polymer molecules are chemically and/or physically crosslinked to form a network structure. Hydrogels can be divided into two categories, synthetic and natural hydrogels. Compare to synthetic hydrogels, natural hydrogels own good biocompatibility and biodegradability. Natural hydrogels include the hydrogels made from polysaccharides such as cellulose, starch, chitosan hyaluronic acid, and the hydrogels made from proteins such as gelatin, collagen.[7,8] The ability of the hydrogel to absorb and retain water/biological fluids has attracted substantial attention for applications in disposable diapers, hygienic napkins, controlled drug delivery system, tissue engineering, sensors, and agriculture.[9,10] The presence of hydrophilic groups on the polymer chains such as hydroxyl, (−OH) carboxyl, (−COOH) and amide is responsible for improved water absorbency characteristics of the hydrogels.

Drought stress causes the formation of oxygen free radicals that leads to increased lipid peroxidation and oxidation stress in the plants. The effects include the dazed height and decreased leaf area. The hydrogel can reduce drought stress on plants and oxygen radical formation by acting as a water reservoir around the plants and release the water in a controlled and sustainable manner. This in turn provides scope for better plant growth and crop yield even in unfavorable climatic conditions.[6,11,12] The hydrogels have the potential of holding water and water-soluble fertilizer that will be slowly released to the plants in accordance with requirements.[11,13,14] This will lead to a significant reduction in water consumption, forbidding plant death, and ameliorating holding in the soil. In horticulture, inadequate amount of moisture in plant roots leads to untimely leaf

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Earth abundant transition metal ferrite nanoparticles anchored ZnO nanorods as efficient and stable photoanodes for solar water splitting

Dipanjan... Dipika Mandal, Debashish Pal, Gobinda Gopal Khan, Kalyan Man...

Affiliations

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Abstract

Poor light a... severe surface charge recombination and fast degradation are the key challenges w... ZnO nanostructures based electrodes for photoelectrochemical (PEC) water splitting. Here, this stu... attempts to design an efficient and durable nano-heterojunction photoelectrode by integrating e... abundant chemically stable transition metal spinel ferrites MFe_2O_4 (M = Co and Ni) nano-particle... n ZnO Nanorod arrays. The low band gap magnetic ferrites improve the solar energy harvesting ab... of the nano-heterojunction electrodes in ultraviolet-visible light region resulting in a maximum in... se of 105% and 190% in photocurrent density and applied bias photon-to-current efficiency re... tiv..., compared to pristine ZnO nanorods. The favourable type-II band alignment at the ferrites/... na... heterojunction provides significantly enhanced photo-generated carrier separation a... ac... endowing the excellent solar H_2 evolution ability (743 and 891 μmol cm^{-2} h^{-1} for ZnO/C... 4 and ZnO/$NiFe_2O_4$ respectively) of the photoanodes by using sacrificial agent. The hybrid nano... ture... deliver long term stability of the electrode against photocorrosion. This work demonstrate... ea... but effective strategy to develop low-cost earth abundant ferrites-based heterojunct... ec...ies, which offers excellent PEC activity and stability.

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ORIGINAL PAPER

MULTI-CRITERIA GROUP DECISION MAKING MODEL USING SINGLE-VALUED NEUTROSOPHIC SET

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ABSTRACT. Background: In this article, we introduce some approaches for decision making in the neutrosophic set. The purpose of this study is to develop a neutrosophic multi-criteria group decision-making (MCGDM) model based on hybrid score-accuracy functions for approving a tender for construction under a simplified neutrosophic environment. Five criteria have been selected from experts' opinions to be considered for the distribution of tender. In this paper, we use the score functions, the accuracy functions, and the hybrid score-accuracy functions of single-valued neutrosophic numbers (SVNNs) and ranking method for SVNNs, those will help for making a decision.
Methods: Decision making under uncertain situation is an important aspect of those days. For this, we have developed the multi-criteria decision-making model using a single-valued neutrosophic set. The main aim is to select an appropriate tender for assigning the work to be done, so that the output will be the best one, under the available resources.
Results: We have developed an algorithm for taking proper decisions for the selection of a contractor for the construction of a public/government work.
Conclusions: We have verified our algorithm with the help of an example. We have considered five criteria. However, the algorithm can be applied for multi-criteria decision making. Also, it can be applied to other case studies too.

Key words: Neutrosophic set, Indeterminacy, Fuzzy set, Decision making.

INTRODUCTION

By using multiple criteria decision making (MCDM) methods, group decision makers can choose the best alternative given multiple criteria. For that, a strategic method needs to be implemented to this decision made in uncertainty. In MCDM difficulties, a group decision matrix is built by aggregating the individual evaluation of each decision-maker to find a group adequate solution that is most preferred by the decision-makers.

Logistics management is a component of supply chain management. It plans, implements, and manages the efficient, effective forward and reverse flow and storage of goods, services, and related information between the point of creation and the point of consumption in order to meet customers' requirements. In this connection our model is expected to be useful for the logistic practices for decision making.

The main fields within logistics are Procurement logistics, production logistics, distribution logistics, disposal logistics. Our work can help in different fields of logistics [Swierczek 2019].

Horizontal logistics collaboration allows a great opportunity for companies to diminish their distribution charges. By forming a combination, companies have the potential to become more productive. However, the selection of a coalition structure is a difficult job for decision-makers. The decision-maker needs to distinguish and choose the best workable partner(s) to carry out a joint plan

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Neutrosophic Fuzzy Matrices and Some Algebraic Operations

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Abstract: In this article, we study neutrosophic fuzzy set and define the subtraction and multiplication of two rectangular and square neutrosophic fuzzy matrices. Some properties of subtraction, addition and multiplication of these matrices and commutative property, distributive property have been examined.

Keywords: Neutrosophic fuzzy matrix, Neutrosophic set. Commutativity, Distributive, Subtraction of neutrosophic matrices.

1. Introduction

Neutrosophic set was introduced by Florentin Smarandache [1] in 1998, where each element had three associated defining functions, namely the membership function (T), the non-membership (F) function and the indeterminacy function (I) defined on the universe of discourse X, the three functions are completely independent. Relative to the natural problems sometimes one may not be able to decide. After the development of the Neutrosophic set theory, one can easily take decision and indeterminacy function of the set is the nondeterministic part of the situation. The applications of the theory has been found in various field for dealing with indeterminate and inconsistent information in real world one may refer to [2,3,4]. Neutrosophic set is a part of neutrosophy which studies the origin, nature and scope of neutralities, as well as their interactions with ideational spectra. The neutrosophic set generalizes the concept of classical fuzzy set [10, 11], interval valued fuzzy set, intuitionistic fuzzy set and so on. In the recent years, the concept of neutrosophic set has been applied successfully by Broumi et al. [12, 13, 14] and Abdel-Basset et al. [15, 16, 17, 18]

The single-valued neutrosophic number which is a generalization of fuzzy numbers and intuitionistic fuzzy numbers. A single-valued neutrosophic number is simply an ordinary number whose precise value is somewhat uncertain from a philosophical point of view. There are two special forms of single-valued neutrosophic numbers such as single-valued trapezoidal neutrosophic numbers and single-valued triangular neutrosophic numbers.

The neutrosophic interval matrices have been defined by Vasantha Kandasamy and Florentin Smarandache in their book "Fuzzy interval matrices, Neutrosophic interval matrices, and

Rakhal Das

Neutrosophic bipolar vague soft set and its application to decision making problems

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Authors Anjan Mukherjee, Rakhal Das

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Description In this paper we study the concept of neutrosophic bipolar vague soft sets and some of its operations. It is the combination of neutrosophic bipolar vague sets and soft sets. Further we develop a decision making method based on neutrosophic bipolar vague soft set. A numerical example has been shown. Some new operations on neutrosophic bipolar vague soft set have also been designed.

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Neutrosophic Multiset Topological Space

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Abstract: In this article we have investigated some properties of netrosophic multiset topology. The behavior of compactness and connectedness in netrosophic multiset topology, continuous function on netrosophic multiset topology etc have been examined. Neutrosophic multiset is a generalization of multisets and neutrosophic sets. Several properties of neutrosophic topological space in view of neutrosophic multiset topological space have been studied.

Keywords: Neutrosophic Multiset; Neutrosophic Minimal set; Neutrosophic Maximal set; Neutrosophic Multiset topology; Compactness, Connectedness; Continuous Neutrosophic Multiset; Separation axioms; Distance function.

1. Introduction

In recent years, multisets and neutrosophic sets have become a subject of great interest for researchers. Mathematicians always like to solve a complicated problem in a simple way and to find out the most feasible solution. Neutrosophy has been introduced and studied by Smarandache [13, 15] as a new branch of philosophy. Recently various papers published on neutrosophic topology and many researchers doing very well, neutrosophic decision making had been studied in [15, 17]. Algebraic properties of neutrosophic set studied in [9, 13], Neutrosophic Bipolar Vague Soft Set, and its property studied in [9]. Smarandache generalizes intuitionistic fuzzy sets (IFSs) and other kinds of sets to neutrosophic sets (NSs). In Smarandache [12, 13], some distinctions between NSs and IFSs are underlined. decision-making problem, algebraic property one can analysis by topological property connectedness and compactness property that property can help to take the decision into a more reliable way. Smarandache [13, 14, 15] also defined various notions of neutrosophic topologies on the non-standard interval. The logic of the neutrosophic set is very clear and its utilization on topology is very beneficial for many standard problems like diagnosis of bipolar disorder diseases, group decision making and analytical property and evaluation Hospital medical care systems etc. [1, 9, 13]. The relation between the intuitionistic fuzzy topology (IFT) on an IFS and the neutrosophic topology are also analyzed by Smarandache.

Multiset theory was introduced by Bilzard [3]. Later on multiset topological space was studied by many researcher Shravan and Tripathy [17, 18, 19]. The purpose of this paper is to construct a new

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Generalized neutrosophic b-open sets in neutrosophic topological space

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Abstract: The purpose of the study is to introduce the notion of generalized neutrosophic *b*-open set in neutrosophic topological space. We define generalized neutrosophic *b*-open set, generalized neutrosophic *b*-interior, generalized neutrosophic *b*-closure and investigate some of their properties. By defining generalized neutrosophic *b*-open set, we prove some theorems on neutrosophic topological spaces. We also furnish some suitable examples.

Keywords: Neutrosophic set; neutrosophic b-open set; generalized neutrosophic b-open set; generalized neutrosophic *b*-interior; generalized neutrosophic *b*-closure

1. Introduction

Smarandache (1998) grounded the Neutrosophic Set (NS) in 1998. From then it became very popular and attracted many researchers' attention for theoretical and practical researches (Broumi et al., 2018; Khalid, 2020; Peng & Dai, 2018; Pramanik, 2013; 2016a; 2016b; 2020; Pramanik & Mallick, 2018; 2019; Pramanik & Mondal, 2016; Pramanik & Roy, 2014; Smarandache & Pramanik, 2016; 2018, Biswas, Pramanik & Giri, 2014; 2016a; 2016b; Dalapati et al., 2017; Dey, Pramanik, & Giri, 2016a; 2016b; Pramanik, Mallick, & Dasgupta, 2018; Mondal & Pramanik, 2015; Pramanik & Dalapati, 2018, Pramanik, Dey, & Smarandache, 2018; Pramanik, Mondal, & Smarandache, 2016a; 2016b).

Salama and Alblowi (2012a) grounded the "Neutrosophic Topological Space" (NTS). Salama and Alblowi (2012b) also presented generalized NS and generalized NTSs. Salama, Smarandache, & Alblowi (2014) studied the concept of neutrosophic crisp topological space. Arokiarani, Dhavaseelan, Jafari, and Parimala (2017) defined neutrosophic semi-open functions and established relation between them. Iswaraya and Bageerathi (2016) studied neutrosophic semi-closed set and neutrosophic semi-open set. Rao and Srinivasa (2017) introduced neutrosophic pre-open set and pre-closed set. Dhavaseelan and Jafari (2018) studied generalized neutrosophic closed sets. Pushpalatha and Nandhini (2019) defined the neutrosophic generalized closed sets in NTSs. Shanthi, Chandrasekar, Safina, and Begam (2018) presented the neutrosophic generalized semi closed sets in

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Neutrosophic Φ-open sets and neutrosophic Φ-continuous functions

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Abstract: We introduce the notion of neutrosophic Φ-open set and neutrosophic Φ-continuous mapping via neutrosophic topological spaces and investigate several properties of it. By defining neutrosophic Φ -open set, neutrosophic Φ -continuous mapping, and neutrosophic Φ -open mapping, we prove some remarks, theorems on neutrosophic topological spaces.

Keywords: Neutrosophic set; Neutrosophic topology; Neutrosophic supra topology; Neutrosophic α-open set; Neutrosophic Φ-open set.

1. Introduction

Smarandache [53] defined the Neutrosophic Set (NS) in 1998 by extending fuzzy set [58], and intuitionistic fuzzy set [2] to deal with uncertain, inconsistent and indeterminate information. An NS Θ defined over the universe Ω, $\alpha = \alpha(\xi, \upsilon, \zeta) \in \Theta$ with ξ, υ and ζ being the real standard or non-standard subsets of $]0, 1^+[$. ξ, υ and ζ are the degrees of true membership function, indeterminate membership function and falsity membership function respectively in the set Θ. Wang, Smarandache, Zhang, and Sunderraman [56] defined Interval NS (INS) as an instance and a subclass of NS by considering the subunitary interval [0, 1]. An INS τ defined on universe Ω, $\alpha = \alpha(\xi, \upsilon, \zeta) \in \tau$ with ξ, υ and ζ being the subinterval of [0, 1]. Wang, Smarandache, Zhang, and Sunderraman [57] defined Single Valued NS (SVNS) as an instance of NS. In SVNS, the degrees of truth-membership function, indeterminacy-membership function and falsity-membership function lie in the interval [0,1]. NS has drawn many researchers' much attention for theoretical as well as practical applications [3-18, 24, 26-34, 36-46, 54-55].

Salama and Alblowi [49] grounded the concept of Neutrosophic Topological Space (NTS). Salama and Alblowi [50] also studied the generalized NS and generalized NTS. Salama, Smarandache and Alblowi [51] presented a new concept on neutrosophic crisp topology. Iswaraya and Bageerathi [23] presented the neutrosophic semi-closed set and neutrosophic semi-open set. Arokiarani, Dhavaseelan, Jafari, and Parimala [1] present the neutrosophic semi-open functions and established some relations between them. Rao and Srinivasa [48] presented neutrosophic pre-open

1. Optimization of bio-chemical degumming of Ramie fiber for improved strength & luster

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Optimization of bio-chemical degumming of Ramie fiber for improved strength & luster

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ABSTRACT

Textile industries are currently not showing much interest in Ramie fibers due to the difficulties associated with their post-harvest downstream processing. The degumming chemicals are often detrimental to the environment upon discharged. Chemical degumming alone results in fibril-released coarse and brittle fibers. This problem has been addressed by combining partial chemical treatment with microbial degumming of the fibers for 72 h at 37 °C using a novel mixed microbial formulation with *Bacillus thuringiensis* MCC2116 and *Bacillus subtilis* ABDR01. The extracellular microbial enzyme-based degumming without the release of fibrils produced a durable, soft, and lustrous fiber with higher tensile strength while utilizing fewer chemicals, thereby leading to lower discharge toxicity. The improved texture and strength compared to complete chemical treatment are attributed to even degumming of the fiber ensuring proper spinnability. Through this approach, Ramie is expected to gain viability in the global textile market, thereby leading to Ramie cultivators' economic benefits.

1. Introduction

Ramie (*Boehmeria nivea*), which is considered as the oldest fiber crop, is of great interest because of its high economic value [1–3]. This bast fiber possesses high tenacity and durability, excellent lustre, and is perfect for fabric production after adequate degumming. Bast fibers include hemp, ramie, flax, jute, kenaf, mesta, urena, banana, and roselle. The emerging global issue related to safer environment-friendly products has shifted the limelight on the use of natural fiber instead of their synthetic counterparts [4]. The quality of the fiber is dependent on growth conditions, degumming, and finishing of the fiber. The conventional process of degumming of natural fiber is energy-intensive and uses many chemicals, which yields high Chemical oxygen demand (COD) in post-degumming effluent [5]. There is ample scope for bio-finishing these natural fibers to make them an essential player in the global textile market.

Ramie plant is easy to grow and can be harvested every 45 days from the second year of plantation up to 16 years. The chemical composition of Ramie is 68.6–76.2 % cellulose, 0.6–0.7 % lignin, 13.1–16.7 % hemicellulose, 1.9 % pectin and 0.3 % wax [6]. The rich cellulose content makes Ramie fiber one of the strongest natural fibers. Despite having several important properties like antimicrobial activity, good absorbency, high durability, the minimum requirement of favorable growth conditions, and pesticides to sustain growth, Ramie has a smaller share in the global natural fiber market to that of cotton and jute [7]. This fact is primarily due to the unfavorable environmental impact of the fiber's downstream processing, which requires the usage of a substantial amount of chemicals and energy. Ramie has, therefore, limited acceptance for textile use. The fiber gum content needs to be reduced through degumming before its application in textile [4,8–10]. The traditional degumming process requires treatment with large amounts of sodium hydroxide (NaOH) and other hazardous chemicals. This process causes serious environmental pollution [11] and necessitates replacement by an environment-friendly degumming method [1]. Different groups have been working on the degumming process of Ramie through the oxidation process [12,13], using Fenton reagent [14], anthraquinone [5] and hydrogen

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2. Minimal medium optimization for soluble sulfate removal by tailor-made sulfate reducing bacterial consortium

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Minimal medium optimization for soluble sulfate removal by tailor-made sulfate reducing bacterial consortium

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ABSTRACT

Modified medium DSMZ 641 used for the growth of SRB consortium developed in the laboratory through enrichment of soil slurry from wastewater fed aquaculture pond at Kolkata India, contained various components that added to the Chemical Oxygen Demand of the solution, making large scale operations using this consortium non-viable. The minimal medium optimization study was carried out using a "one at a time" approach analyzing sulfate reducing ability of the consortium. The consortium reduced soluble sulfate concentration by 70 and 78% (starting from an initial concentration of 2000–3000 mg/L) under suspended and immobilized states, respectively, in 50 mL working volume. The process upon scaling up to 9 L in a vertical biofilm reactor under batch mode could reduce sulfate from the optimized medium by 76% in 4 h, while the same in modified DSMZ 641 was 74%. Response Surface Methodology revealed the optimum concentration of Carbon (Lactic Acid), Nitrogen (Yeast Extract, Ammonium Chloride), and Phosphorus (Potassium Phosphate) in the medium to be 6 mL/L, 500 mg/L each and 750 mg/L respectively.

KEYWORDS

Bioremediation; mineral medium optimization; one at a time approach; response surface methodology; sulfate reducing bacteria

Introduction

With the advent of Industrial revolution, copious amounts of fresh water are used for industrial processes, resulting in the generation of huge amounts of wastewater requiring immediate treatment (Amabye 2015). In recent times, sulfate containing wastewater has emerged as a major source of pollution besides nitrates, phosphates, and heavy metals (Silva et al. 2002). The discharge limit for sulfate is < 1000 mg/L in most countries (Ramachandran 2012). Sulfate in wastewater mainly arises from mining and metallurgical operations (Hulshoff Pol et al. 1998; Hao et al. 2014; Nasipuri et al. 2010a, 2010b; Sabumon 2016) due to the use of sulfuric acid/reduced sulfate compounds namely sulfides, thiosulfate and dithionate. Increased sulfate concentration in groundwater (Darbi et al. 2003) gives a characteristic taste and causes adverse effects like laxative and skin problems (Janssen, Dijkman, and Janssen 2000). Physico-chemical processes for sulfate removal include electrodialysis, reverse osmosis, ion exchange, and nanofiltration. The use of lime or barium salts for sulfate precipitation (Reinsel 2015) and energy requirement for mechanical mixing and the waste disposal stringency make these processes non-feasible (Reinsel 1999; Kinnunen et al. 2018) during large scale operation. Besides, problems related to membrane fouling and regeneration, backwashing, and pretreatment (Jain et al. 2017) make the physical operations expensive and cumbersome. Different microbial processes have been reported for specific wastewater treatment (Saha et al. 2018; Halder et al. 2020; Ray Chaudhuri et al. 2020). Hence an alternative cost-effective solution was sought through the utilization of Sulfate reducing bacteria (SRB) for sulfate bioremediation (Benedetto et al. 2005; Sharma 2012; Nasipuri et al. 2010a).

SRB are found in abundance in anoxic conditions where they reduce sulfate into hydrogen sulfide. The sulfides can also be oxidized by chemolithotrophic (oxic) or phototrophic (anoxic)

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3. An eco-friendly strategy for dairy wastewater remediation with high lipid microalgae-bacterial biomass production

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Barley beta-Glucan and Zymosan induce Dectin-1 and Toll-like receptor 2 co-localization and anti-leishmanial immune response in *Leishmania donovani*-infected BALB/c mice

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Abstract

Toll-like receptors (TLRs), TLR2 in particular, are shown to recognize various glycans and glycolipid ligands resulting in various immune effector functions. As barley β-glucan and zymosan are the glycans implicated in immunomodulation, we examined whether these ligands interact with Dectin-1, a lectin-type receptor for glycans, and TLR2 and induce immune responses that can be used against *Leishmania* infection in a susceptible host. The binding affinity of barley β-glucan and zymosan with Dectin-1 and TLR2 was studied in silico. Barley β-glucan- and zymosan-induced dectin-1 and TLR2 co-localization was studied by confocal microscopy and co-immunoprecipitation. These ligands-induced signalling and effector functions were assessed by Western blot analyses and various immunological assays. Finally, the anti-leishmanial potential of barley β-glucan and zymosan was tested in *Leishmania donovani* -infected macrophages and in *L. donovani*-infected BALB/c mice. Both barley β-glucan and zymosan interacted with TLR2 and dectin-1, but with a much stronger binding affinity for the latter, and therefore induced co-localization of these two receptors on BALB/c-derived macrophages. Both ligandsactivated MyD88- and Syk-mediated downstream pathways for heightened inflammatory responses in *L. donovani*-infected macrophages. These two ligands induced T cell–dependent host protection in *L. donovani*-infected BALB/c mice. These results establish a novel modus operandi of β-glucans through dectin-1 and TLR2 and suggest an immunomodulatory potential against infectious diseases.

1 | INTRODUCTION

β-glucans are glucose polymers with a backbone of linear β(1,3)-linked D-glucose molecules, branching β(1,6)-linked side chains of diverse sizes and at different intervals along the backbone. Among the β-glucans with β(1,3), β(1,4) and β(1,6) linkages, only β(1,3) β-glucan is immuno-stimulatory. Barley β-glucans have primarily β(1,4) linkages, whereas the fungal β-glucans have a β(1,3) backbone branched with short β(1,6)-linked side chains.[1,2] Zymosan—a mixture of β(1,3)(1,6) glucans and mannose, is a crude cell wall extract of the yeast *Saccharomyces cerevisiae*. The β-glucan molecular

Ashok Patidar and Trishna Mahanty contributed equally to this work.

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Stereoselective Synthesis of Spirooxindole Derivatives Using One-Pot Multicomponent Cycloaddition Reaction and Evaluation of Their Antiproliferative Efficacy

Rajat Ghosh, Jorge B. Vitor, Eduarda Mendes, Alexandra Paulo, and Pratap Chandra Acharya*

Cite this: *ACS Omega* 2020, 5, 42, 27332−27343
Publication Date: October 16, 2020
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International Journal of Environmental Analytical Chemistry >
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Original Articles

Fluorescence- and FRET-based mercury (II) sensor

Jaba Saha, Sudip Suklabaidya, Jayasree Nath, Arpan Datta Roy, Bapi Dey, Dibyendu Dey,
...show all

Pages 789-807 | Received 13 Mar 2019, Accepted 16 May 2019, Published online: 22 Jul 2019

Download citation | https://doi.org/10.1080/03067319.2019.1641202 | Check for updates

ABSTRACT

A mercury (II) sensor has been proposed based on Fluorescence Resonance Energy Transfer (FRET) between N,N'-dioctadecyl thiacyanine perchlorate (NK) and Octadecyl rhodamine B chloride (RhB). Out of these two molecules, NK is sensitive to Hg^{2+} ions due to the presence of sulphur atom in it. Accordingly, presence of Hg^{2+} ions affects the NK fluorescence as well as FRET from NK to RhB. Our results showed that NK fluorescence intensity and FRET efficiency linearly decrease with an increase in Hg^{2+} ion concentration. With proper optimisation, present system under investigations can be used to sense Hg^{2+} ions in aqueous solution with a detection limit of 9.13 ppb. Advantage of this present system is that it is very simple compared to the other FRET-

In this article

so it works under aqueous environment. This method has also
al lake water, and satisfactory results were obtained.

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Self-standing films of tetraindolyl derivative and saponite clay mineral with reversible colour switching properties

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ABSTRACT

Functional nanosized two-dimensional clay mineral particles are considered as ideal host materials to manipulate the properties of incorporated organic molecules due to their high cation exchange capacity, layer structure and intercalation properties. The interlayer height of clay layers can be manipulated by simultaneous wetting and drying steps. Here, we have studied the chromatic behaviour of an organic dye generated *in-situ* from 1,4-di-bis-indolylmethane-benzene in the interlayer space of synthetic saponite (SSA). Initially transparent, self-standing organo-clay hybrid films become red upon heating due to aerobic oxidation suggesting *in-situ* generation of organic dye and increases the planarity of the intercalated organic molecules. Upon swelling the same hybrid film becomes yellow, due to the partial disturbance in the planarity of generated dye via C-C bond rotation. Simultaneous heating and swelling resulted in a reversible colour transition (clearly visible through the naked eye) between red and yellow for at least 30 cycles. This kind of system may have potential applications as a colorimetric sensor and in the field of optics (optical switching and optical memory etc).

1. Introduction

The dependence of spectroscopic and physicochemical behaviour of molecular assemblies upon the molecular arrangement is a topic of current research. The properties of the molecules depend not only on their structure but also on their pattern of the organization when confined in various nano-sized spaces and in ultrathin films [1–5]. It has been observed that the photophysical and photochemical properties of dyes change markedly when incorporated into various host materials, such as micelles, mesoporous materials, zeolites, and swelling clay minerals with respect to the properties of these molecules in solution and in pure form [6–11]. In particular, the modulation of the optical properties is of increasing interest for the development of new generations of functional molecular materials, notably in the fields of optical communication and data processing, sensors and optical memory.

In this regard clay materials have attracted great interest as host materials over the past decade because of their unique interlayer space, flat large surface, negatively charged layer, ion-exchange properties, exfoliation/stacking ability of the layers and modifiability of their surface with cationic organic molecules [8–11]. The planarity of the π-conjugated system of the confined organic molecule is increased, which in turn extends the π-conjugation length. Also, the fluorescence quantum yield of the dyes is enhanced due to the suppression of vibrational motion of the confined molecules [8,12–15]. Accordingly, organic molecules confined in clay mineral-organic hybrid systems often exhibit unique spectroscopic properties that are not observed in the solution or crystalline states.

In general, organic molecules tend to aggregate due to hydrophobic-hydrophobic interaction, π-π stacking and Vander-Waals interaction [8,16,17]. However, a large number of organic molecules can be incorporated in between the clay mineral layers without aggregation [18]. It has been shown that clay minerals can be used to control the molecular position, manipulate the molecular properties and provide a unique microenvironment for various photophysical reactions such as energy

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A comparative study between two percentage of occurrence methodologies for computing ionospheric scintillation statistics

B. Paul, B.K. De, K. Saha, A. Guha

https://doi.org/10.1016/j.asr.2020.04.024

Abstract

This study presents a detailed comparative analysis of the two widely used percentage of occurrence methodologies used to compute the statistics of ionospheric scintillation activity based on the data of a Global Positioning System (GPS) Ionospheric Scintillation and (TEC) Total Electron Content Monitor (GISTM) receiver located at the northern Equatorial Ionization Anomaly (EIA) crest region Agartala (23.76°N, 91.26°E) of the Indian subcontinent, during 2012–2015 of the rising, peak and declining solar activity periods of solar cycle-24. Both the methodologies, one based on the number of scintillation event days and another based on the number of scintillation events, provide the correct and similar scintillation statistics qualitatively. But a rigorous comparative study shows significant quantitative differences between the statistics obtained by the two methodologies. The variation of scintillation occurrence obtained by the two methodologies with solar and geomagnetic activity shows that the methodology based on the number of scintillation events provides more accurate and physically acceptable results. Though this fact may be familiar to some researchers but still the scientific community has been using both the methodologies in parallel to compute scintillation statistics. So, from this comparative analysis future researchers can get a clear scenario of the advantages and disadvantages of these methodologies over one another before adopting any one of those for computing scintillation statistics. We also want to highlight the issue to the scientific community to come to a common platform by adopting the percentage of occurrence methodology based on the number of scintillation events for future studies.

Keywords

Ionospheric irregularities; Scintillation; Equatorial ionization anomaly; Percentage of occurrence; Solar and geomagnetic activity

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Cationic and anionic concentration dependent elastic properties of zinc blende specimens within $Cd_xZn_{1-x}S_ySe_{1-y}$ quaternary system: Calculations with density functional theory

Sayantika Chanda [a], Manish Debbarma [a], Debankita Ghosh [a], Subhendu Das [a, b], Bimal Debnath [a], Rahul Bhattacharjee [a, c], Surya Chattopadhyaya [a]

Show more

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Abstract

Elastic properties of zinc blende $Cd_xZn_{1-x}S_ySe_{1-y}$ quaternary alloys have been calculated with density functional theory oriented FP-LAPW scheme. Elastic stiffness constants and hardness of specimens have been increased almost linearly with increasing sulphur composition at each fixed cadmium composition, while their decrease have been observed with increasing cadmium composition at each fixed sulphur composition in any binary-ternary/ternary-quaternary system. Mechanical and dynamical stability, elastic anisotropy, compressibility, ductility and fair plasticity have been calculated as the key features of each specimen. Mixture of covalent and ionic bonding with dominant role of covalent, central nature of interatomic forces and bending over stretching in chemical bonds have been observed in each compound. Calculated Debye temperature suggests ZnS as the stiffest and CdSe as the softest among all compounds. Calculated Gruneisen parameter has confirmed anharmonic nature of interaction between the atoms. Thermal conductivities and melting temperatures of all the specimens have also been computed.

Introduction

Fabrication of quaternary alloys has been considered as an advanced procedure for manipulating various properties with improved accuracy compared to the ternary alloys in materials science and it expands the range of their target-oriented applications. The proper choice of constituent binary compounds plays the key role behind the success of such fabrication procedure. In this paper, elastic properties of zinc blende specimens under $Cd_xZn_{1-x}S_ySe_{1-y}$ system, bounded by two anionic ternary CdS_ySe_{1-y}, ZnS_ySe_{1-y} and two cationic ternary $Cd_xZn_{1-x}S$, $Cd_xZn_{1-x}Se$ systems, have been reported. All the ternary compounds have again been originated from the four basic binaries CdS, CdSe, ZnS and ZnSe. Therefore, elastic properties of such ternary and quaternary alloys would be completely different from their basic binary constituents.

Group IIB–VIA diatomic wide-direct-band-gap (Γ-Γ) cadmium chalcogenides CdS and CdSe and zinc chalcogenides ZnS and ZnSe semiconductors are available in zinc blende (B3) phase [1] under ambient conditions. Visual displays, laser diodes operating in blue-green spectral range, hetero-structure lasers having wide band gap,

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Density functional study on structural and optoelectronic properties of cubic $Mg_xZn_{1-x}S_ySe_{1-y}$ semiconductor quaternary alloys

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Abstract. In the case of technologically important $Mg_xZn_{1-x}S_ySe_{1-y}$ quaternary alloys, structural and optoelectronic properties have been calculated with density functional theory (DFT)-based full-potential linearised augmented plane-wave (FP-LAPW) approach. The Perdew–Burke–Ernzerhof generalised gradient approximation (PBE-GGA) for structural properties and both the modified-Becke–Johnson (mBJ) and Engel and Vosko GGA (EV-GGA) for optoelectronic properties are employed to calculate the respective exchange-correlation potentials. Each specimen within the $Mg_xZn_{1-x}S_ySe_{1-y}$ quaternary system is a direct band-gap (Γ–Γ) semiconductor. The lattice constant decreases, while bulk modulus and band gap increase nonlinearly with increasing anionic (S) concentration y at each cationic (Mg) concentration x. On the other hand, nonlinear increment in lattice constant and band gap, but decrement in bulk modulus is found with increase in cationic concentration x at each anionic concentration y. Calculated contour maps for lattice constants and energy band gaps would be useful in fabricating new quaternary alloys with preferred optoelectronic features. Optical properties of the specimens within the $Mg_xZn_{1-x}S_ySe_{1-y}$ quaternary system show several interesting features. Chalcogen-p→Zn-5s, 4p and chalcogen-p→Mg-4s, 4p optical excitations contribute intense peaks in each $\varepsilon_2(\omega)$ spectrum. The composition dependence of each calculated zero-frequency limit shows opposite trend, while each calculated critical point shows similar trend of composition dependence of band gap. Moreover, calculations suggest the possibility of growth of several cubic $Mg_xZn_{1-x}S_ySe_{1-y}$ quaternary specimens on GaAs and InP substrates.

Keywords. MgZnSSe quaternary alloys; modified-Becke–Johnson and Engel and Vosko generalised gradient approximation functional; structural properties; optoelectronic properties; lattice matching with GaAs and InP substrates.

PACS Nos **45.10.Ab; 62.20.Dc; 62.20.Dx; 62.20.de; 81.40.Jj**

1. Introduction

The synthesis of ternary alloy is a basic process of regulating optoelectronic characteristics of semiconductors in materials science for some target-oriented applications to semiconductor devices. But, synthesis of quaternary alloys needs a more improved technique to tune various physical properties of semiconductors more precisely to widen their applications.

The group IIB–VIA transition metal chalcogenides, ZnS and ZnSe, are used to fabricate field effect transistors, ultraviolet radiation sensors, gas and chemical sensors, nanogenerators [1], blue–green laser diodes [2], wide-band-gap-heterostructure lasers [3] and optical wave guides [4]. On the other hand, IIA–VIA alkaline-earth chalcogenides, MgS and MgSe, are used to fabricate erasable optical memory [5] and wide-band-gap light emitters [6].

The zinc-blende (B3) is experimentally proven as one of the most stable phases of ZnS and ZnSe [7] as well as MgS and MgSe [8,9]. Moreover, experiments on structural, electronic and optical [10–16] features

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Density functional study of elastic and thermal properties of cubic mercury-zinc-chalcogenide ternary alloys

MANISH DEBBARMA, SUBHENDU DAS, BIMAL DEBNATH, DEBANKITA GHOSH, SAYANTIKA CHANDA, RAHUL BHATTACHARJEE & SURYA CHATTOPADHYAYA

Bulletin of Materials Science **43**, Article number: 268 (2020)

Abstract

First principle calculations of elastic and thermal properties of zinc-blende specimens within $Hg_xZn_{1-x}S$, $Hg_xZn_{1-x}Se$ and $Hg_xZn_{1-x}Te$ ternary systems are executed. Elastic stiffness constants decrease non-linearly with increasing Hg-concentration in each system. Each cubic sample is mechanically and dynamically stable, elastically anisotropic, compressible against elastic deformation, ductile and fairly plastic. Hardness of specimens in each system reduces with enhancement in Hg-composition. Mixed kind of bonding with dominancy of covalent over ionic in most cases, bond bending over stretching and central type of interatomic bonding forces are calculated. In each

Original Paper | Published: 23 October 2020

First-principle calculations of structural and optoelectronic properties of cubic $Cd_xZn_{1-x}S_ySe_{1-y}$ quaternary alloys with modified Becke–Johnson (mBJ) functional

Sayantika Chanda, Debankita Ghosh, Bimal Debnath, Manish Debbarma, Rahul Bhattacharjee & Surya Chattopadhyaya

Indian Journal of Physics **95**, 2313–2325 (2021)

Abstract

First-principle calculations in association with modified Becke–Johnson (mBJ-GGA) potentials have been performed on optoelectronic properties of $Cd_xZn_{1-x}S_ySe_{1-y}$ quaternary alloys. Each semiconductor specimen within this quaternary system is a direct band gap (Γ–Γ) semiconductor. An increase in anionic (S) concentration y results in nonlinear decrease in lattice constant and increase in bulk modulus and fundamental band gap (E_g) at each cationic (Cd) concentration x. In contrast, reverse trend is observed in cationic concentration (x) dependence of each of these parameters at each anionic concentration (y). Calculated lattice

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Samrat Hore

Ensuring balance through optimal allocation of experimental units with known categorical covariates into two treatments

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Authors: Aditya Chatterjee Samrat Hore, Anup Dewanji

Publication date: 2020/3/24

Journal: Statistics

Publisher: Taylor Francis

Description: The balanced allocation of experimental units with regard to various known covariates among several treatment groups, before the physical experiment takes place, is often considered to be the most reasonable allocation scheme in all intervention studies and clinical trials. It is well-known that covariate mean balance over various treatment groups ensures widely used *D*- and *A*-optimality. However, it is not well-understood if the reverse proposition holds or not. For continuous covariates, it has been observed previously by the same authors, through a computationally intensive method, that covariate mean balance is nearly achieved for an optimal design. In the present paper, it has been analytically established that, with categorical covariates, the covariate mean balance can be ensured through *D*- and *A*-optimality.

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Growth and Reproduction of *Perionyx excavatus* (Perrier) During Vermicomposting of Different Plant Residues

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Nat. Env. & Poll. Tech.
Website: www.neptjournal.com

ABSTRACT

The data on growth and reproduction of composting earthworms may be beneficial for large ... earthworm production. The growth and reproduction of *Perionyx excavatus* were assessed in li...

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EARTHWORM CASTING ACTIVITY AND THEIR NUTRIENT CONTRIBUTION TO THE SOILS OF PASTURE, NATURAL FOREST AND RUBBER PLANTATION IN TRIPURA INDIA

Published Dec 9, 2020

Page: 11-22

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Abstract

Present study revealed casts of a total of 9 earthworm species (*Eutyphoeus assamensis*, *E. comillahnus*, *E. scutarius*, *E. gigas*, *Lampito mauritii*, *Kanchuria* sp., *Metaphire houlleti*, *Pontoscolex corethrurus* and *Glyphidrilus* sp.) from three land-use systems (pasture, natural forest and rubber plantation) of West Tripura and Sepahijala districts of Tripura, India. Different species of earthworms voided casts in different forms i.e. granular, globular or tower like. Strong positive correlation was found between earthworm body weight and diameter of casts ($r = 0.68$, $P = 0.01$). Among the three studied ecosystems, natural forest had the highest annual casts production of 23.44 tonnes ha^{-1} $year^{-1}$. On the other hand pasture and rubber plantation exhibited an annual cast production of 11.16 tonnes ha^{-1} $year^{-1}$ and 9.92 tonnes ha^{-1} $year^{-1}$ respectively. Out of 9 earthworm species, *E. assamensis*, *P. corethrurus* and *L. mauritii* contributed the highest annual cast production of 8.44 tonnes $ha^{-1}year^{-1}$, 6.65 tonnes $ha^{-1}year^{-1}$ and 5.00 tonnes $ha^{-1}year^{-1}$ under natural forest, rubber plantation and

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Earthworm Casting Activities Under Bamboo Plantations of We
Impact on Soil Physicochemical Properties

Authors

Sourabh Chakraborty [1], Niladri Paul [2], P. S. Chaudhuri [1]

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EARTHWORM COMMUNITY CHARACTERISTICS IN THE SOILS OF TWO TERRESTRIAL LAND USE SYSTEMS (BANANA AND FLOWER PLANTATIONS) IN WEST TRIPURA (INDIA)

Shilpa Dhar
Tripura University

Priyasankar Chaudhuri
Tripura University

Banana is the most established, economically important fruit crop in India. Floriculture is also of great commercial importance. As earthworms are important soil macrofauna which have a great role in soil fertility and crop production, the present study deals with the [illegible] earthworm communities in the soils of banana and flower plantations of West Tripura [illegible]. The study was conducted during March 2015 to November 2017. Earthworms were collected from the banana and flower plantations by digging (25 cm x 25 [illegible] method. Temperature, moisture, pH and organic matter [illegible] depth of soils because earthworms are mostly concentrated [illegible] parameters such as density, biomass, relative abundance [illegible] viz. indices of diversity, dominance etc. were measured [illegible] communities in the studied sites revealed the presence of 12 [illegible] belonging to 4 families and 10 genera in the banana plantations [illegible] earthworms belonging to 4 families and 6 genera in the flower plantations [illegible] was 63% between the two habitats (banana and flower). The [illegible] biomass of earthworms in the flower plantations were 186 ind. m-2 [illegible] respectively which were significantly (p< 05) higher than that of the mean [illegible] and biomass (76 g m-2) of earthworms in the banana plantations [illegible] index was comparatively higher in the banana plantations (0.78) than [illegible] (0.60) whereas, Simpson Dhar and Chaudhuri, UPJOZ, 41(9): 40- [illegible] index was more in flower plantations (0.42) than that in banana [illegible] number of earthworm species in the flower gardens compared to [illegible] is possibly due to its monoculture nature and higher management [illegible] fluctuations of earthworm density (juvenile, young and adult) along with [illegible] showed that pre-monsoon to post-monsoon i.e. April-November are the most suitable periods for earthworm activity and reproduction.

Community characteristics | Community characteristics | Physico-chemical properties of so | Density and biomass of...

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VERMICULTURE OF NATIVE EARTHWORM Perionyx ceylanensis IN DIFFERENT EXPERIMENTAL DIETS

Published Jul 31, 2020

Page: 116-122

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PRIYASANKAR CHAUDHURI
Department of Zoology, Tripura University (A Central University), India.

Abstract

Perionyx ceylanensis is a newly discovered epigeic species with promising vermicomposting ability. Being a native vermicomposting earthworm species, it is necessary to know about detailed biology of this species so that it can be used in vermiculture- based biotechnology. But literature is scanty regarding its growth and reproduction in different organic wastes. Our present study deals with the growth and reproduction of *P. ceylanensis* in different experimental diets. Growth and reproduction of native epigeic earthworm species, *P.ceylanensis* was studied in different experimental diets mixtures such as CD: cowdung; CB: cowdung- bamboo leaf litter (1:1 w/w); CRB: cowdung-rice bran (1:1 w/w) under laboratory conditions in order to select best diet for the vermiculture of *P. ceylanensis*. Earthworms were weighed and searched for juveniles on weekly basis. Highest rate of growth of the species was recorded in CB (12.91 ± 2.03mg/ worm/ day) which was significantly ($P<.05$) higher than CRB (4.49 ± 0.59) and CD (6.34 ± 0.046). Highest rate of reproduction was recorded in CRB (11.39±2.21 juveniles/ worm/ week) diet and lowest in CD (2.02± 0.22 juveniles/ worm/ week). However, the rate of reproduction in terms of juvenile production was at par ($P>.05$) among CB (8.925 ± 1.48 juveniles/ worm/ week) and CRB (11.39±2.21 juveniles/ worm/ week).The maximum weight gain was observed in CB (616.25 ±106.2) diet. Percent (%) increase in biomass was highest in CB (215.81± 25.71) followed by CRB (101.38 ± 15.18) and lowest in CD (85.72 ±17.81). Percent (%)

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Original Research

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Physico-chemical changes during vermicomposting of a terrestrial weed, *Mikania micrantha* and leaf litters of *Acacia auriculiformis* and *Bambusa polymorpha* mixed with cowdung

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Paper received: [illegible] 2019 Revised received: 21.10.2019 Accepted: 05.12.2019

Abstract

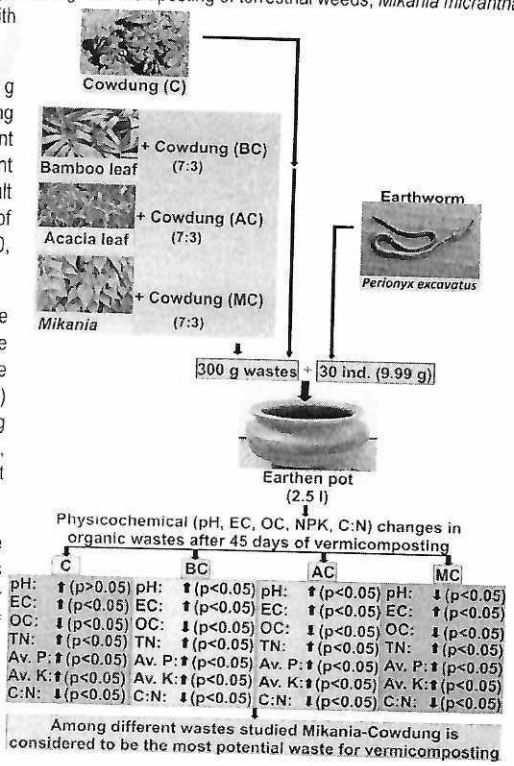
Aim : The aim of the present study was to understand the physico-chemical changes during vermicomposting of terrestrial weeds, *Mikania micrantha* and leaf litters of *Acacia auriculiformis* and *Bambusa polymorpha* mixed with cowdung

Methodology : Vermicomposting was done in 2.5 l earthen pot, each having 300 g wastes materials (cowdung alone (300g) and different litter wastes mixed with cowdung in 7:3 ratio). Based on our pilot study using cowdung and plant wastes in different ratios it was observed that earthworm thrived well and acted better in 7:3 (plant wastes : cowdung) compared to other ratios. Each pot was inoculated with 30 adult earthworms, *Perionyx excavatus* [cumulative weight (g) 9.99±0.09] after 21 days of precomposting of wastes. Samples from vermicomposting pots were collected on 0, 45 days for physico-chemical analysis of wastes.

Results : Vermicomposting brought about changes in pH values near to neutral at the end of the experiment in all the treatments. Significant increase ($p<0.05$) in the electrical conductivity, total nitrogen (%), available phosphorus (mg $100g^{-1}$), available potassium and a significant decrease ($p<0.05$) in total organic carbon (%) and C:N ratio from initial feed mixtures to final product in all the vermicomposting treatments were observed. The maximum rise in electrical conductivity, nitrogen, available phosphorus and available potassium were recorded in the vermicompost obtained from Mikania-cowdung-mixtures.

Interpretation : Vermicompost derived from Mikania-cowdung mixtures may be considered as suitable organic resource. Addition of carbonaceous materials such as leaf litters, sawdust, straw etc. with Mikania-cowdung mixtures is recommended for vermicomposting to increase the C:N ratio of vermicompost for slow release of nutrients.

Key words : *Acacia auriculiformis*, *Bambusa polymorpha*, Leaf litters, *Mikania micrantha*, *Perionyx excavatus*, Vermicomposting



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COCOON BIOLOGY OF EARTHWORMS OF WASTE DEPOSIT SITES OF TRIPURA (INDIA)

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Abstract

Earthworm species viz. *Perionyx excavatus*, *Dichogaster bolaui*, *Lampito mauritii*, *Metaphire posthuma* found in the waste deposit sites of West Tripura were reared in field soils mixed with cow dung in order to examine their growth and reproductive potential under laboratory conditions. The epigeic earthworms, *P. excavatus* and *D. bolaui* were continuous breeder with high fecundity (187 and 92 cocoons worm ^{1} year^{-1}) and low incubation period (13 and 14.2 days). Anecic earthworm, *L. mauritii* and endogeic *M. posthuma* were semi-continous and discrete breeder respectively. Highest and lowest hatching success of cocoons were recorded in *D. bolaui* (82%) and *M. posthuma* (25%) respectively. Interestingly in the earthworm species, *P. excavatus* (1.15 hatchling^{-1} cocoon^{-1}), *D. bolaui* (1.7 hatchling ^{1} cocoon^{-1}), *L. mauritii* (1.8 hatchling^{-1} cocoon^{-1}) more than one hatchlings emerged out from a single cocoon, whereas, *M. posthuma* produced only one hatchling per cocoon. Cocoon production of earthworms was significantly higher (P<.05) during summar and monsoon. Incubation periods of cocoons increased significantly (P<.05) with the rise in temperature within a temperature range of 24°C to 33°C for the cocoons produced by *L. mauritii* and *M. posthuma* while incubation periods of the cocoons shortened significantly (P<.05) with the rise in temperature in case of *P. excavatus* and *D. bolaui*. With the rise in temperature from 25°C to 32°C number of cocoon hatching increased (P<.05) in *P. excavatus* and *D. bolaui* while decreased (P<.05) in *L. mauritii*. In all earthworm species, biomass peaks coincide with the peak cocoon production. Continuous breeding strategies

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Do Indian stock prices respond to domestic macroeconomic variables?

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Joy Das[2]

Abstract

The volatility in the Indian stock markets in the last couple of decades has raised a pertinent question - are these meaningful institutions that are linked to the overall macroeconomic health of the country or are they mere casinos where people make and lose millions? Keeping in mind this question, the present study investigated the effect of a subset of macroeconomic variables on the Indian stock market. The study uses monthly time series data covering the period from April 2005 to December 2019 and employs the ADF unit root test, Johansen co-integration test, VECM, and Granger causality for data analysis. Variance decomposition analysis has also been performed to determine the significance of each variable in generating fluctuations in other variables. The results show that the macroeconomic variables are co-integrated with the stock prices suggesting the presence of a long-run relationship. The pairwise Granger causality test indicates that the exchange rate, money supply, and short-term interest rate granger cause stock prices. The VDC analysis indicates that stock prices in India are relatively exogenous in relation to other macroeconomic variables. The study concludes that volatility in stock prices in the future to a certain extent can be forecasted by the information provided by the selected macroeconomic fundamentals.

Keywords: *Macroeconomic variables, stock market, unit root test, Granger causality test, Variance decomposition analysis, VECM*

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AMBIENT APPRAISAL

Seedling Morphology of Some Medicinal Plants from Leguminosae of Tripura, North-East India

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Study Area: Suryamaninagar, India
Coordinates: 23.75'N; 91.27'E

Key words: Conservation Policy, Phenogram, Plant Life cycle

Abstract

Seedling characters are important and promising from the taxonomic as well as evolutionary point of view. Seedling morphology of twenty-two medicinal plants of Leguminosae was studied, collected from different parts of Tripura, North-east India. The investigation was based on the germination pattern, position of cotyledon, hypocotyl, epicotyl, and paracotyledon and eophylls development. An artificial key has been constructed for easier identification of plants in their juvenile stage. Phenogram has been prepared to investigate the correlation between the investigated taxa.

Introduction:

Seedling is basically juvenile stages of a plant germinating from seed, as per Matheus & Lopes (2007) seed and seedling morphological characterization is important for species differentiation and recognition at a young stage in the field. Seedling characters are important and reliable in the delimitation of species, genera and families. A critical examination of the correlation between a group of characters of both the adult as well as the juvenile plant has repeatedly shown results in better understanding of taxonomically difficult taxa. (Bokdam, 1977). The study of seedling morphology, which had been a less explored field in flowering plants, particularly in angiosperms, has now emerged as an essential discipline for taxonomic research at present. So, proper studies on seedling and their morphology will be helpful for their early identification and conservation of natural resources which in turn shall help in the conservation of biodiversity. Seedling characteristics of *Pongamia pinnata* (L.) Pierre has been studied by Khan *et al.* (2015). Seedling morphology in the identification of some Indian species of *Bauhinia* L. (Caesalpiniaceae) has been studied by Das and Paria (1999). Roy & Datta (2014) studied Early identification and phnetic analysis of eight species of subtribe Cassiineae (Leguminosae: Caesalpinioideae). Seedling morphology is a less explored work in India, so in this study, an attempt has been made to study seedling morphology of some Leguminosae plants. In this study *Abrus precatorius* L., *Bauhinia acuminata* L., *Caesalpinia bonduc* (Linnaeus) Roxburgh, *Caesalpinia pulcherrima* (L.) Sw., *Cajanus scarabaeoides* (L.) Thouars, *Calopogonium mucunoides* Desv., *Canavalia gladiata* (Jacq.) DC., *Clitoria ternatea* L., *Crotalaria spectabilis* Roth, *Crotalaria pallida* Aiton, *Crotalaria verrucosa* L., *Desmodium gangeticum* (L.) DC., *Desmodium heterocarpon* (L.) DC., *Desmodium triflorum* (L.) DC., *Mimosa pudica* L., *Mucuna bracteata* DC., *Phyllodium pulchellum* (L.) Desv., *Pueraria montana* var. *chinensis* (Ohwi) Sanjappa & Pradeep, *Pueraria phaseoloides* (Roxb.) Benth., *Tephrosia purpurea* (L.) Pers., *Uraria crinita* (L.) DC., and *Uraria rufescens* (DC.) Schindl have been investigated based on seedling characteristics. The key prepared in the present study is completely a new initiative for the early identification and conservation of the studied taxa. The phenogram presented in this study is the first report of the implication of seedling morphological character in the phenetic analysis of the members of the family Leguminosae found in Tripura.

Methodology:

Tripura is a state in North-East India and considered as a biodiversity hotspot. The state lies between 22°56'to 24° 32' North latitudes and 91°09' to 92°20' East longitudes with an aerial extent of 10,491.69 sq. km.

The seedling specimens *Abrus precatorius* L., *Bauhinia acuminata* L., *Caesalpinia bonduc* (Linnaeus) Roxburgh, *Caesalpinia pulcherrima* (L.) Sw., *Cajanus scarabaeoides* (L.) Thouars, *Calopogonium mucunoides* Desv., *Canavalia gladiata* (Jacq.) DC., *Clitoria ternatea* L., *Crotalaria spectabilis* Roth, *Crotalaria pallida* Aiton, *Crotalaria verrucosa* L., *Desmodium gangeticum* (L.) DC., *Desmodium heterocarpon* (L.) DC., *Desmodium triflorum* (L.) DC., *Mimosa pudica* L., *Mucuna bracteata* DC., *Phyllodium pulchellum* (L.) Desv., *Puerariamontana* var. *chinensis* (Ohwi) Sanjappa & Pradeep, *Pueraria phaseoloides* (Roxb.) Benth., *Tephrosia purpurea* (L.) Pers.,

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Differential sensitivity of *Allium cepa* L. and *Vicia faba* L. to aqueous extracts of *Cascabela thevetia* (L.) Lippold

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ABSTRACT

Cascabela thevetia (L.) Lippold, a well-known plant of family Apocynaceae is used as traditional medicine, has pharmacologically active constituents, yet is highly toxic, due to high glycoside content in seeds, leaves and fruits. So, an assessment of cytotoxicity/mutagenicity becomes prerequisite for its therapeutic efficacy. Two *in vivo* test systems -*Allium cepa* test and *Vicia faba* assay were used for genotoxicity monitoring; with the macroscopic parameter of root growth and the microscopic parameters of Mitotic Index (MI), chromosomal aberrations (CA) and Micronuclei (MN) of meristematic cells as reliable indicators of toxicity. The aqueous leaf and fruit extract of the plant were found to be significantly cytotoxic at 3mg/ml with all sorts of CA. Significant reduction in MI, abundance of CA, presence of MN after recovery, supported by statistical analyses indicated high/ sub lethal genotoxicity. However, the sensitivity of the two systems varied, with *A. cepa* being more sensitive to reduction in MI and *V. faba* being more sensitive for CA specially MN. Thus cautious, appropriate and minimum requisite of the plant should be used in therapeutic applications.

1. Introduction

Cascabela thevetia (L.) Lippold, a well-known plant of family Apocynaceae, popular as Yellow Oleander, is cultivated as an ornamental tree in tropical and subtropical regions of the world (Bandara et al. [illegible]) including Africa and India ([illegible]). Secondary metabolites present in different parts of the plant lend it pharmacological activity ([illegible] 2001; [illegible] et al. [illegible]). Pharmacologically active constituents include terpenoids, flavonoid, steroids and glycosides ([illegible] et al. 2012). Various parts of the plant are medicinally important. According to the Ayurvedic Pharmacopeia of India, Vol I (Anonymous [illegible]), the dried leaves of the plant (plant known as Harapriya, Aśvamāra in Sanskrit, Kaner in Hindi) with healing properties have therapeutic uses and used as Kasisādi Taila formulation. In Africa, leaves and bark were macerated with water for treating amenorrhea, leaf sap infusion used as nose and eye drops and to soften corn, calluses, leaves crushed in water to treat colds, leaf decoction used to treat jaundice, fever and as purgative ([illegible]). In India, seed oil used to treat skin infections, dried bark powder used to treat diabetes ([illegible]) and has decongestant activity ([illegible]), leaves used to control toothache. There are reports of antioxidant (Srivastava et al. 2012), antispermatogenic (Gupta et al. 2011), piscicidal (Singh et al. 2010), anti-termite (Kareru et al. 2010), antifungal (Gata-Goncalves et al. 2003; Ambang et al. 2010), antidiarrheal, antimicrobial, cytotoxic (Hassan et al. 2011), anti-inflammatory (Thilagavathi et al. 2010), and antifertility (Deshmukh and Zade 2014) activities. Bioactive compounds isolated from ethyl-acetate fraction of flowers possess anti-oxidant activity and anti-inflammatory activity (Solomon et al. 2016); flavanone and flavanol glycosides of leaves showed inhibitory activities against HIV-1 reverse transcriptase and HIV-1 integrase (Tewtrakul et al. 2002).

However, due to presence of cardiac glycosides, the plant is toxic to cardiac muscles and autonomic nervous system (Langford and Boor 1996). All parts of the plant are poisonous-the seeds are extremely toxic due to presence of glycosides thevetin A, B and neriifolin (Everist 1974; Langford and Boor 1996; Randall 2002), followed by leaves, fruit and sap (Bandara et al. 2010). Ingestion of seeds, whether accidentally or intentionally causes moderate to severe poisoning, clinically very similar to digoxin abuse/ poisoning (Sreeharan et al. [illegible]; Brewster 1986; Langford and Boor 1996). Nausea, vomiting are common and early symptoms, diarrhea and abdominal pain also appear. Ventricular fibrillation, refractory cardiogenic shock ensues in severely poisoned patients; finally, bradycardia, cardiac dysrhythmia and electrolyte disbalance cause death (Sreeharan et al [illegible]; [illegible] et al. 2010; Mandal 2012; Pravath and Arulnithy [illegible]). Deliberate self-harm is an important matter of concern in developing countries, where it accounts for the 12th most common

KT performed the *Allium cepa* test and *Vicia faba* assay. SB analyzed the results, performed statistics, conceived, designed and drafted the manuscript. We also declare that we have no conflict of interest.

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RESEARCH ARTICLES

Phosphate solubilizing bacteria and arbuscular mycorrhizal fungi associated with *Hevea brasiliensis* under plantations of Tripura, India

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Abstract
The current investigation was focused to enumerate seasonal population of phosphate solubilizing bacteria (PSB) and to examine colonization of arbuscular mycorrhizal (AM) fungi associated with rubber trees from the plantations of Tripura, India. The study also aims to identify AM fungi and characterize PSB from the rhizosphere of rubber trees. The results indicated that AM fungal colonization and PSB population were higher during monsoon and significantly lower in winter. Significant correlation was observed between populations of PSB and AM fungal colonization. Phosphate solubilization index of PSB isolates was significantly exhibited highest by *Bacillus tequilensis*. Twenty seven AM morphotypes and five isolates of PSB were identified. The higher number of species recovered from the genus having the order *Glomus* > *Rhizophagus* > *Claroideoglomus* = *Sclerocystis* > *Acaulospora* = *Funneliformis* > *Ambispora* = *Diversispora* = *Dentiscutata* = *Gigaspora* = *Redekera* = *Septoglomus*. The results indicated that the rubber plantations harbour robust composition of both the soil microflora.

Keywords *Hevea brasiliensis* · Seasonal · Mycorrhizal colonization · Phosphate solubilization index · Bacterial population

Introduction

The most prevalent symbiotic associations occurs between land plants and arbuscular mycorrhizal (AM) fungi (Fitter 2005) found in seventy to ninety percent of plants (Smith and Read 2008) from Glomeromycota phylum (Tedersoo, 2018). AM fungi are reported as a vital component in agriculture as they are associated with the increase of nutrient uptake and plant growth (Mosse 1973; Harley and Smith 1983).

Of the total microbial population in soil, phosphate solubilizing bacteria (PSB) constituted one to fifty percent (Chen et al. 2006). PSB enhances growth and yield of the plants by facilitating phosphorus uptake in the plants (Arcand and Schneider 2006; Pérez et al. 2007). They have the potential to increase fertility of the soil with the conversion of insoluble phosphorus (P) to soluble P (Narula et al. 2000).

The combined effect of AM, PSB association with plants has been reported earlier (Singh and Kapoor 1998; Mukherjee and Rai 2000; Minaxi et al. 2013). The solubilized phosphate with the assistance of PSB is uptaken by plant roots more proficiently via mycorrhizal hyphal system (Rodriguez and Fraga 1999).

Hevea brasiliensis (Wild. ex A. Juss.) Mull. Arg. belonging to Euphorbiaceae family imparted both positive and negative effects on soil fertility, microclimate, carbon sequestration along with loss of biodiversity (Kox 2000; Cheng et al. 2007; Fox and Castella 2013). In Tripura, it has made positive contributions by restoring the degraded ecological system (Krishnakumar and Meenattoor 2003). Rubber plantation harbours robust microbial diversity including AM fungi in the rhizosphere (Deka et al. 1998; Chakraborty et al. 2016; Herrmann et al. 2016).

As evident by available literature, study of seasonal soil physico-chemical properties and tripartite association viz., AM fungal colonization and PSB populations in the plantation of rubber is yet to be conducted. Therefore, seasonal soil physico-chemical properties along with colonization of AM fungi, and their composition and study with regard to

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RESEARCH ARTICLES

Biocontrol and plant growth promoting potential of *Trichoderma yunnanense*

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Received: 3 March 2020 / Revised: 17 June 2021 / Accepted: 18 June 2021

Abstract
Biological control agents can be an effective and safe sustainable alternative method to reduce the detrimental effects of synthetic fungicides. In the present study, an airborne microfungi *Trichoderma yunnanense* showed broad spectrum antifungal and plant growth promoting activities. The characterization of the fungal isolate was confirmed by morphological features, DNA sequencing and phylogenetic tree analysis. Various growth parameters such as root and shoot length (13.76 mm and 19.3 mm), root and shoot dry weight (0.048 g and 0.037 g) were enhanced in the treated plants compare to control. In treated plants. The total chlorophyll and sugar content were found to be higher than control. *Trichoderma yunnanense* showed higher antagonistic potentiality (50–66%) against *Alternaria brassicicola, Alternaria solani, Aspergillus ochraceus* but showed lower potentiality against *Pencillium oxalicum* (21.42%). Thus the strain of *Trichoderma yunnanense* possessed growth-promoting potential and potent to antagonistic activity against plant pathogenic fungi.

Keywords *Trichoderma yunnanense* · Internal transcribed spacer · Growth promoting fungi · Antagonism

Introduction

Trichoderma species are identified and characterized as potential plant symbionts and biocontrol agent against different soil-borne pathogens so as to enhance plant growth (Garnica-Vergara et al. 2016). The control effects of *Trichoderma* on soil borne phytopathogens are comparatively higher to synthetic fertilizers and they exhibit prolonged persistence in soil post application (Konappa et al. 2020). Immense biological importance of *Trichoderma* strains streak biologist to identify it properly. Morphological identification is not adequate for species identification because of homoplastic character (Badaluddin et al. 2018). The advancement of new biological approach to analyse the genomic DNA sequences and their sequential application in fungal systematics results in the elucidation of evolutionary relationships among different species of *Trichoderma*. Nowadays, nuclear ribosomal internal transcribed spacers (ITS) are used for the molecular characterization of fungi (Pandian et al. 2016).

Several *Trichoderma* species have been found to protect plants from pathogenic fungi, like *Rhizoctonia solani* (Zhang and Zhuang 2020). As a result, they're frequently utilised as bio-control agents in agriculture, with over 250 commercial *Trichoderma*-based bio-fungicides registered worldwide (Woo et al. 2014).

Globally, Chickpea is the third most crucial legume crop and one of the most important crops in India. Chickpea is rich in digestible protein source and most widely consumed legumes (Robinson et al. 2019). Unfortunately, many soil borne fungal pathogens, which survive for many years, cause serious damage of yield and quality of the crop (Smolińska and Kowalska 2018). *Trichoderma* species are utilized as bio-fungicides as well as s plant growth promoter. *Trichoderma* may influence plant growth by several mechanisms such as a reduction in pollutant toxicity, the induction of systemic resistance in the host plant, the solubilisation of sparingly soluble minerals, the production of phytohormones

Pintu Karmakar and Koyel SenGupta have equally contributed.

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Research Article

Diversity of Foliar Endophytic Fungi in *Artocarpus heterophyllus* Lam. and *Citrus reticulata* Blanco of Tripura

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ABSTRACT

Present investigation dealt with the isolation and diversity of foliar fungal endophytes from two fruit yielding plants of Tripura state. In addition, seasonal distributions of endophytes regarding fruiting and non-fruiting seasons in two host plants were also studied. Twenty one fungal strains along with one nonsporulating hyaline form were isolated as foliar endophytes from the two host plants. In both fruiting and non-fruiting seasons from *Citrus reticulata*, seven foliar endophytic fungi were isolated. Meanwhile, from *Artocarpus heterophyllus* in both the seasons, eleven fungal endophytes with one nonsporulating hyaline form were also isolated. The relative frequencies of the isolated fungi from both *A. heterophyllus* and *C. reticulata* in fruiting and non-fruiting season significantly differed among the sampling sites, whereas relative frequencies individual endophytic fungus showed no significant differences among various sampling sites.

Keywords: Microfungi, Artocarpus heterophyllus, Citrus reticulata, Fruiting and non-fruiting season, Fungal diversity

Introduction

Endophytes are microorganisms, usually, fungi and bacteria that live within the plant tissues intercellularly and intracellularly for a period of their life cycle without producing any visible symptoms of the disease under normal conditions [1]. Fungal endophytes can invade and live inside the tissues of the living host plant and do not cause any visible injury to the host plant [2]. They inhabit the interior of leaves, branches, stems of plants, without any apparent damage to the host plant [3]. Relationship between fungal endophyte and the host plants range from mutualistic or symbiotic to antagonistic or slightly pathogenic [4]. According to Hawksworth and Lücking [5], 3 to 8% of the estimated fungal diversity is known. Endophytic mycoflora can be regarded as an important component of fungal biodiversity of plants. Colonization and distribution of endophytic fungi in host plant mostly determined by the host plant itself [6]. According to Paulus *et al.* [7] variation in chemical profiles of the host plant influence the differential distribution of endophyte assemblages in different hosts. Endophytic fungi reported to have the ability to produce bioactive secondary metabolites with activities identical or almost same of their respective hosts [8]. *Artocarpus heterophyllus* is a popular fruit in different parts of India for easy availability in summer seasons. The plant belongs to the Moraceae family and reported to be a rich source of antidiabetic, antimicrobial, antioxidant and antibacterial agents [9]. The plant was also reported to be effective in treating diarrhoea, fever, dermatitis and cough. The methanolic extracts of leaves possess broad-spectrum antibacterial properties against different gram-positive and gram-negative bacteria [10]. Not only that, methonlic extracts of leaves also exhibited an inhibitory effect on various cariogenic bacteria [11]. Ash of jack fruit leaves reported to have wound healing effects and heal ulcers also. The infusion of mature leaves was effective in treating diabetes,

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RESEARCH ARTICLE

Production of Exopolysaccharides (EPSs) and Evaluation of Biological Properties of *Pleurotus flabellatus* (Berk and Br.) Sacc

Sanjit Debnath[1] · Bapi Debnath[1] · Rahul Saha[1] · Atrayee Dutta[1] · Panna Das[2] · Ajay Krishna Saha[1]

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Abstract Species of *Pleurotus* have gained tremendous interest due to its nutritional and various medicinal applications. The specific goals of this research work are to evaluate the effects of different carbon and nitrogen sources for mycelial biomass, average growth rate and exopolysaccharide (EPSs) production, estimation of total carbohydrate content and antioxidant activities of EPSs and determination of antibacterial properties of various extracts of *Pleurotus flabellatus*. The starch (3.84 ± 0.43 g/l and 0.55 ± 0.21 g/l/day) and peptone (1.57 ± 0.87 g/l and 0.22 ± 0.12 g/l/day) were the best ($p < 0.05$) carbon and nitrogen sources, respectively, for better mycelial growth and average growth rate of *P. flabellatus*, whereas EPSs production was highest in sucrose (3.467 ± 0.96 g/l) and beef extract (6.00 ± 0.59 g/l). The highest amount of carbohydrate from EPSs was observed in starch (3.39 mg/100 g) and peptone (4.05 ± 0.08 mg/100 g) medium ($p < 0.05$). The highest free radical scavenging activities of EPSs were observed in glucose (83.80 ± 0.87%) and calcium nitrate (89.01 ± 1.61%) at 16.0 mg/ml concentration ($p < 0.05$). The broth extract of *P. flabellatus* showed highest ($p < 0.05$) antibacterial activity against *B. subtilis*, whereas EPSs extract showed lowest activity against *B. subtilis*; meanwhile, all three types of extract did not show activity against *S. aureus*. Therefore, more research work is necessary to find out the active chemicals constituents of EPSs and their functional relationships.

Keywords Bioactivities · Antibacterial · Antioxidant activities · BSL medium · Polysaccharide

Significance Statement Present findings revealed that starch and peptone were the best carbon and nitrogen sources for better mycelial growth and average growth rate of *P. flabellatus*, whereas EPS production was higher in sucrose and beef extract. EPSs produced from best carbon and nitrogen sources were found to be a significant source of carbohydrate. EPSs of various carbon and nitrogen sources have the potentiality to scavenge the free radicals, which will be valuable source material for pharmaceutical industry. Present findings also documented that the various extracts of *P. flabellatus* (EPSs, broth and mycelia) has potent antibacterial activity against B. subtilis and E. coli. The further work is still needed to explore the active chemicals constituents of EPS and their various functional relationships.

Abbreviations

EPS	Exopolysaccharide
MCCT	Mushroom culture collection tube
BSL	Basal synthetic liquid
CMC	Carboxymethyl cellulose
DW	Dry weight
FRS	Free radical scavenging
DPPH	1,1diphenyl-2-picrylhydrazyl
BHT	Butylated hydroxytoluene
PDA	Potato dextrose agar
SD	Standard deviation
PCA	Principal components analysis
EC	Effective concentration

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"Standing out" and "fitting in": understanding inspiration value of masstige in an emerging market context

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ABSTRACT

PurposeThis study aims to investigate the role of middle-class consumers' need for uniqueness (CNFU), consumer susceptibility to interpersonal influence (CSII), inspiration and behavioral intentions toward masstige products. Specifically, this study e

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Das, Manish; Saha, Victor; Balaji, M

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METRICS

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Uniqueness and luxury: A moderated mediation approach

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ABSTRACT

Luxury consumption has become a worldwide phenomenon. Irrespective of consumers? need for uniqueness being considered as an important psychological factor impacting luxury consumption intention, research seldom investigates the impact o

AUTHORS

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Research Article

Acculturation and apparel store loyalty among immigrants in Western countries

Md Ashaduzzaman, **Charles Jebarajakirthy** ✉, Manish Das & Amit Shankar

Pages 488-519 | Received 08 Nov 2019, Accepted 25 Aug 2020, Published online: 05 Nov 2020

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ABSTRACT

Western countries have experienced a steady increase in the number of immigrants since 2000 and these immigrants appear to be a sizeable market segment for apparel retailers in Western host countries owing to their acculturation. This study investigates how acculturation of immigrants drives their loyalty to apparel stores in

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Understanding on-the-go consumption: A retail mix perspective

REVIEW BADGES

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ABSTRACT

On-the-go (OTG) consumption is a growing phenomenon in the food and beverage industry. Drawing on the theory of consumption values, this study is conducted to acquire a better understanding of the influence that retail-mix elements have on OTG

AUTHORS

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METRICS

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Resistive Switching of the Tetraindolyl Derivative in Ultrathin Films: A Potential Candidate for Nonvolatile Memory Applications

Surajit Sarkar, Hritinava Banik, Sudip Suklabaidya, Barnali Deb, Swapan Majumdar, Pabitra Kumar Paul, Debajyoti Bhattacharjee, and Syed Arshad Hussain*

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A New Point-of-Interest Approach Based on Multi-itinerary Recommendation Engine

Joy Lal Sarkar, Abhishek Majumder

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ARTICLE INFO

Keywords:
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tourist
cost
itineraries
POIs

ABSTRACT

The significance of tourism in the globe today is enormous since it is a major source of income and jobs for a nation. Tourists are facing a range of difficulties as they select suitable tours, consisting of several itineraries in terms of their interests and distinct constraints. An itinerary consists of many Points of Interest (POIs) and a POI can further be splitted into several attractions which are named as POI within POI. For selecting the itinerary, the existing techniques use the characteristics of POIs. However, a POI consists of many attractions. Out of these, one dominating attraction's type is considered as POI type. This ignores the other type of attraction's present in that POI. It may cause improper selection of itineraries. Therefore, selection of itineraries by considering POI within POI is of great benefit. But, it is very challenging. For this task, we suggest an algorithm called PWP. It recommends multiple itineraries that are based on the interest of visitors, popularity of itineraries and the cost of itineraries. If a tourist wants to visit unknown areas, the PWP algorithm can be expanded further. We have taken the similar user's features to advise multiple itineraries using the Flickr dataset. The findings show that the proposed PWP algorithm out-performs the baseline algorithms in terms of real-life matrices and heuristic based metrics.

1. Introduction

It is a difficult task to recommend a tour and a tourist itinerary (Li, Lee & Yang, 2019). A tourist has his / her limitations and favorite locations (Trachanatzi, Rigakis, Marinaki & Marinakis, 2020). There are countless Internet resources that provide the tourists a lot of information, without taking into account their interests and limitations (Lim, 2015). The data provided on the Internet can easily confuse a tourist during selection of best itineraries (Lim, Chan, Karunasekera & Leckie, 2017). If a visitor plans his / her trip, he / she may spend several days on several attractions. In such a situation, he/she would prefer to go for several itineraries instead of a single itinerary. An itinerary may consist of multiple Points of Interest (POIs) (Qiao, Luo, Li, Tian & Ma, 2020),(Esposito, Mancini, Brito & Moreno, 2019). The POIs where tourists are more interested need to be chosen in multiple itineraries. Many attractions may be present in a POI. Among all the attractions, the most prominent one dominates other attractions. The POI's type will be same as the most prominent attraction's type. The other attractions' type present in the POI gets ignored. Therefore, during selection of POI, the attractions within it should play very significant role (see Fig. 1, 2). The key difference between the current POI technique and the proposed technique is that the existing techniques recommend POI based on the original form for which it is known, but the proposed technique considers POI-attractions which are also present inside this actual POI. In this work, these attractions are considered as standard POIs. For convenience, we write these POIs as POI-attractions. A tourist may be interested to visit a park or sea beach but has little interest in the temple. Let, the tourist visits a beach or park which is adjacent to a prominent temple. Because of the presence of the prominent temple, the whole POI was marked as temple. Considering the category of POI (temple) already visited by the tourist, the existing works try to recommend itineraries containing POIs of type temple during his/her visits to other places. But while recommending itineraries, it will not consider POIs marked as beach or park, where the tourist is actually interested. This is because, these techniques do not access the POI-attractions inside a POI. Therefore, an appropriate technique is necessary to recommend itineraries considering the POI-attractions present inside a POI. The aim of the paper is to propose a technique which constructs multiple itineraries considering POI-attractions. For example, a POI St. Pete Beach, Florida can be classified as a beach category (Fig. 1), but there are so many POIs available in St. Pete Beach, such as Cafe, Restaurants, etc. Let, some user who is not interested in beach, visits a restaurant in St. Pete Beach. When the user goes to some other place, the existing techniques will not recommend POIs of type restaurant while recommending itineraries to him/her. Instead, these techniques will recommend POIs of type beach. The proposed technique considers the POI-attractions from different POIs and recommends itineraries based on those POI-attractions.

In this paper, we propose an algorithm called PWP based on a multi-itinerary recommendation engine. It has been designed to recommend multiple itineraries in an efficient and user-friendly way for the total duration of the journey, depending on interest, tour popularity and the cost of travel. The system framework for the proposed approach is outlined in Fig.3. The details such as POI visit durations, travel sequences, number of POI visits etc. about the Local User

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Computación y Sistemas

DCQSH: Dynamic Conflict-Free Query Scheduling in Heterogeneous Networks during Emergency

V. Ramasamy, B. Gomathy, Joy Lal Sarkar, Chhabi Rani Panigrahi, Bibudhendu Pati, Abhishek Majumder

Abstract

There can be disasters such as tsunami, fire-related incidents, etc. in several ways. Mobile devices and the cloud occupy a significant position in connectivity and relief operations in these circumstances. This would be more important an efficiently performing query facility in mobile devices in a crisis situation. To achieve the mentioned facility, a Dynamic conflict-free query scheduling approach for heterogeneous networks during the emergency situation (DCQSH) is suggested in this paper. DCQSH is specifically built to schedule queries for the heterogeneous communication networks. DCQSH's key feature would be that it can optimize the query efficiently and often operates with complex tasks and adjusts the query rate without rebuilding the existing transfer schedule. DCQSH operates within heterogeneous networks, as it could accommodate the condition where the mobile devices become low energy-efficient on the networks. The experimental findings reveal that DCQSH outperforms in a heterogeneous scenario in terms of its relation to baseline algorithms. MATLAB framework was utilized to validate the simulation performance.

Keywords

Disasters, mobile device, networks, parallel, distributed

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CAREER MATURITY OF SECONDARY LEVEL SCHOOL STUDENTS OF WORKING AND NON-WORKING MOTHERS

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Abstract

The purpose of the present research was to find out overall and dimension wise significant differences in the career maturity of secondary level school students of working and nonworking mothers of Tripura. The sample of the research consisted of 400 secondary level school students (200 secondary level school students of working mothers, 200 secondary level school students of non-working mothers) of class XII under Tripura Board of Secondary Education belonging to state of Tripura were selected randomly from twenty different secondary level schools of eight district, Tripura. The 'Career Maturity Inventory' constructed by Dr. Nirmala Gupta (2005) was administered to the selected sample to assess their career maturity. The data so collected was analyzed statistically by employing mean, SD, t-test and ANOVA. The research revealed that there were insignificant differences between the secondary level school students of working and non-working mothers on the measure of overall career maturity, career choice attitude, self-appraisal, occupational information, goal selection, planning, problem solving ability components of career maturity.

Keywords: Secondary school students, working and non-working mothers, career maturity, career choice attitude.

Introduction:

Career maturity is usually defined as a readiness, attitude, skills and competency to cope effectively with the career development works. Naturally a career matured person is so much capable to make an accurate and realistic career choice and decision. Career mature persons have the ability to identify occupational preferences and to implement activities as per order to achieve their goals. According to Super (1955), the concept of career maturity was defined as the place reached on the continuum of vocational development from exploration to decline. Thus, career maturity is the degree which one has reached to making realistic and mature career choices. It is the development of individuals in cognitive, emotional and other psychological factors. Therefore, career maturity is the extent to which an individual acquire the capability to make career developmental tasks which are applicable for individual's life stage. Career maturity is very much important to identify appropriate career guidance i.e. information regarding self-knowledge; acquiring skills for decision-making; collecting career information and converting it into knowledge of the occupational field; developing self-knowledge and knowledge of the occupational field. Therefore, career maturity is conceptualized as an individual's readiness to make well informed, age – appropriate career decision, and to shape one's career carefully in the face of existing societal opportunities and constraints (Salami 2008). Although educational, vocational and career choices are made by an individual very sincerely, because it is the one of most crucial decision for every individual. But they are certainly influenced by many social, environmental

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AN EXPLORATORY STUDY ON THE AGRICULTURAL HOUSEHOLDS OF NORTH EAST INDIAN STATES

Abhijit Sarkar*
Indraneel Bhowmik**

ABSTRACT

Even though the North-Eastern regional (NER) states of India are undergoing structural transformation in the form of reduced share of the primary sector in the state domestic product and the decreasing share of agriculture in the work force, these states remain predominantly rural and agrarian. The monthly income, consumption expenditure; expenses on farming and crop returns, average gross cropped area and value of harvest of the agricultural households of the NER states as revealed in the 70th round of NSSO indicate that extent of cultivation in the region is more than the national average, while the expenses and return are less. Also there are wide variations among the states in terms of the economic condition of the households across the states.

Keywords : Agricultural household, livelihood, gross cropped area, income, expenditure.

Introduction :

The states of North-Eastern Region (NER) of India remain predominantly rural and agrarian.Isolation of the region from mainland India, 98% international border, poor infrastructure, low productivity, lack of market access, absence of private investment, quest for ethnic identity, frustration due to remoteness and backwardness, problem of insurgency vis-a-vis political unrest and other factors have situated the region far behind rest of India from the development point of view.

The agrarian character of the states remained even with the ongoing structural transformation of reduced share of the primary sector in the state domestic product and the decreasing share of agriculture in the work force. Census 2011 states that in NER 35.82 % of the total workers are cultivators and 14.75 % are agricultural labourers. The share of cultivators and agricultural labourers in total workers are 51.51% and 6.16% respectively in Arunachal Pradesh (ARP), 33.93% and 15.42% in Assam (ASM), 39.51% and 9.58% for Manipur (MNP), 41.72% and 16.73% in Meghalaya (MGL), 47.17% and 16.73% in Mizoram (MZM), 55.20% and 6.46% in Nagaland (NGL), 38.10% and 8.43% in Sikkim (SKM) and 20.14% and 24.06% respectively in Tripura (TRP). The percentage of cultivators in total workforce in Tripura is the lowest in NER, whereas that of agricultural labourers is the highest.

Similarly, the share of agricultural and allied activities in NSDP, during 2004-05 to 2014-15, declined from- 37.22%to 31.42%in Arunachal Pradesh; 26.76 to 21.67% in Assam; 25.08% to 20.29%in Manipur; 24.45 to 16.11% in Meghalaya; 35.83 to 25.87% in Nagaland; 18.76% to 10.37% in Sikkim; and 26.07% to 22.70% in Tripura. Nonetheless, the population dependent on agriculture remains quite high even though agriculture has failed to create surpluses for investment and generate employment and enhanced purchasing power.

Objective, Data and Methodology :

The objective of the study is to examine the economic condition of agricultural households in the rural areas of NER states on the basis of monthly income, consumption expenditure; expenses on farming and crop

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The Indian Forester (founded in 1875)
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Home > Volume 147, Issue 2, February 2021 > **Guleria**

Terminalia chebula (Harar) Characterization by using Morphological Descriptors in Himalayan Region

Vipan Guleria [1*], Punit Chaudhary [2], Amol Vashisth [3], Kamal Sharma [4], Thiru Selvan [5], Sanjeev Thakur [6]

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Abstract

Terminalia chebula Retz. plays a crucial role in foodstuff, medicine, industry, and environmental protection. The skill of recognizing the variants of the species is very important in some applications, including conservation, strain types identification and performance of strains under different agro-ecological situation. However, it is a difficult task to identify plant species because it requires specialized knowledge. Developing morphological classification system for different genotypes and variants is necessary and valuable since it can help specialists as well as the public to identify and avoid cheating. It is a medicinal tree species which is highly valued in Indian system of medicine viz Ayurveda, Yunani, Sidha etc. *Terminalia chebula* trees are naturally distributed in the Sub Himalayan tract up to 1400 m above mean sea level in subtropical region, although planted trees can be seen in throughout the Northern Indian region. Research has been conducted to survey, locate the variations, identify the productive strains and also identify the ecological distribution of *T. chebula* in different agro-ecological regions of Himalayan region. The results indicated a high diversity in fruit and leaf shapes. Nine shapes of fruits were observed in the studied locations (Oblong "Matka type", Oblong dark colour with short neck, Pyriform, Pyriform type fruit with Medium neck, Narrowly obovate without neck, Clavate with prominent neck, Oval, Ellipsoid and light coloured and Narrowly obovate medium in size with acute tip. Analysis showed that there were significant differences in leaf morphometric characters, too. Nine shapes of leaves were observed in the region viz. Cuspidate, Elliptic, Aristate, Obtuse, Lanceolate, Ovate, Oblique, Ovoid and Oblong

Keywords

Keywords: Descriptors, Terminalia chebula, diversity, morphology, Strains , India, Himalayan, medicinal tree, leaf, fruits

Full Text:

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Patterns and driving factors of biomass carbon and soil organic carbon stock in the Indian Himalayan region

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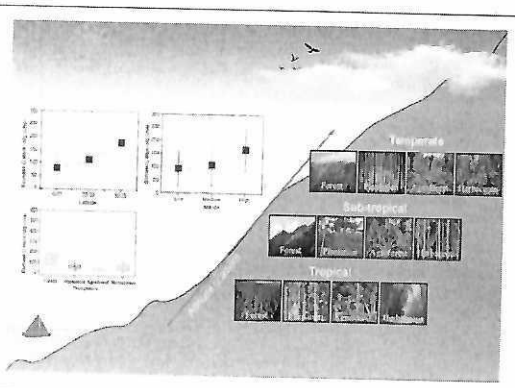
HIGHLIGHTS

- Biomass and soil carbon stocks were estimated for the Indian Himalayan Region.
- Data synthesis and machine learning techniques were used to predict carbon stock.
- Environmental variables and carbon stock were insignificantly correlated.
- XGBoost model closely predicts carbon stock in the Indian Himalayan Region.

GRAPHICAL ABSTRACT



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ABSTRACT

Tree-based ecosystems are critical to climate change mitigation. The study analysed carbon (C) stock patterns and examined the importance of environmental variables in predicting carbon stock in biomass and soils of the Indian Himalayan Region (IHR). We conducted a synthesis of 100 studies reporting biomass carbon stock and 67 studies on soil organic carbon (SOC) stock from four land-uses: forests, plantation, agroforest, and herbaceous ecosystem from the IHR. Machine learning techniques were used to examine the importance of various environmental variables in predicting carbon stock in biomass and soils. Despite large variations in biomass C and SOC stock (mean ± SD) within the land-uses, natural forests have the highest biomass C stock (138.5 ± 87.3 Mg C ha^{-1}), and plantation forests exhibited the highest SOC stock (168.8 ± 74.4 Mg C ha^{-1}) in the top 1-m of soils. The relationship between the environmental variables (altitude, latitude, precipitation, and temperature) and carbon stock was not significantly correlated. The prediction of biomass carbon and SOC stock using different machine learning techniques (Adaboost, Bagging, Random Forest, and XGBoost) shows that the XGBoost model can predict the carbon stock for the IHR closely. Our study confirms that the carbon stock in the IHR vary on a large scale due to a diverse range of land-use and ecosystems within the region. Therefore, predicting the driver of carbon stock on a single environmental variable is impossible for the entire IHR. The IHR possesses a prominent carbon sink and biodiversity pool. Therefore, its protection is essential in fulfilling India's commitment to nationally determined contributions (NDC). Our data synthesis may also provide a baseline for the precise estimation of carbon stock, which will be vital for India's National Mission for Sustaining the Himalayan Ecosystem (NMSHE).

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ASSESSMENT ON THE IMPACT OF THE TRIPURA EARTHQUAKE (JANUARY 3, 2017, M_W = 5.6) IN NORTHEAST INDIA

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Abstract: The northeastern part of the Indian subcontinent, considered as the most active seismic zone of the Indian subcontinent, was hit by an earthquake of M_w 5.6 on January 3, 2017. The epicenter of this earthquake was Kanchanbari located in the Dhalai district of Tripura. The present study aims to assess the environmental and socio-economic impact of this earthquake in the vicinity of the epicenter. To assess and determine the level of damage, the affected areas were visited during the first week of the 2017 earthquake. Various Government offices were also consulted to acquire data on damages caused by the earthquake. Moreover, Remote Sensing and Geographical Information System (RS & GIS) techniques were applied to address the influence of this earthquake on bank erosion. During the field visit, the striking features of soil liquefaction generated by the earthquake were observed in the flood plain area of the Manu River. Landslide, with three casualties in India and the neighbor Bangladesh, and damages of infrastructure were also reported. Additionally, an assessment of the bank erosion study revealed that the rate of the post-earthquake bank erosion increased to 592%, compared to the pre-earthquake bank erosion within the study length of the Manu River. The findings highlighted that the impact of this earthquake is minimal. However, the seismotectonic features and observation of the liquefaction within the risk zone of the earthquake indicate a possible significant threat for the future.

Keywords: earthquake; impact assessment; liquefaction; awareness; Tripura (Northeast India)

Introduction

Earthquakes are considered the most disastrous natural calamity of the Earth's surface (Tiwari, 2002) which results from a sudden release of energy in the Earth's crust (Gahalaut, 2010). It is usually caused by the movements along the faults, which have evolved through geological and tectonic processes (Tiwari, 2002). This disastrous natural calamity can cause death and injuries to a large extent. Moreover, earthquakes damage human properties and destroy natural resources on massive scale. According to the United Nations Developmental Programme (UNDP) (2003) and Gahalaut (2010), earthquakes often cause extensive casualties, economic damage, and significant hydrologic and hydrogeologic changes. On the other hand, as secondary hazards/disasters, rock falls, landslides, avalanches, tsunami, etc. occur due to earthquakes.

The northeastern part is considered the most active seismic zone of the Indian subcontinent. The region consists of the East Himalaya, which extends approximately E–W and marks a collision

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Research paper

Bimetallic and trimetallic Cd(II) and Hg(II) mixed-ligand complexes with 1, 1-dicyanoethylene-2,2-dithiolate and polyamines: Synthesis, crystal structure, Hirshfeld surface analysis, and antimicrobial study

Suman Adhikari[a,*], Tirtha Bhattacharjee[b], Priyatosh Nath[c], Arijit Das[d], Jerry P. Jasinski[e], Raymond J. Butcher[f], Debasish Maiti[c]

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Antimicrobial activity

ABSTRACT

Two new neutral bimetallic and trimetallic mixed-ligand complexes of Cd(II) and Hg(II) were obtained by using potential flexible molecular building blocks, 1,1-dicyanoethylene-2,2-dithiolate dipotassium salt (K_2*i-mnt*) and polyamines. X-ray diffraction analysis revealed that dithiolate (*i-mnt*$^{-2}$) acts as a bridging unit in the slightly distorted square pyramidal non-polymeric bimetallic cadmium derivative *[Cd$_2$(tn)$_2$(i-mnt)$_2$]* (**1**). The tri-metallic Hg(II) based cocrystallized aggregates of *[Hg$_2$(tren)(i-mnt)$_2$]* and *[Hg(tren)(i-mnt)]*(**2**), has three different coordination environments around Hg(II) metal centers and one thiolate end of *i-mnt*$^{-2}$ links two Hg atoms in bridging mode. The N–H···S, N–H···N, C–H···S and C–H···N type hydrogen bonds contribute in crystal packing architecture, revealing interesting geometrical patterns and graph-set-motifs. The Hirshfeld surface mapped over d_{norm} exhibited N···H/H···N type intermolecular interactions as the principal contributors in crystal packing. The *in-vitro* antimicrobial study evaluated by disk diffusion and broth dilution method with the compounds **1**, **2** and ligand K_2*i-mnt* against Gram-positive (*Staphylococcus aureus 9542* and *Streptococcus pneumonia 2672*) and Gram-negative (*Klebsiella pneumonia 7407* and *Shigella flexneri 1457*) human pathogenic bacterial strains show their promising antimicrobial activities.

1. Introduction

Coordination compounds were considered to be very promising for profuse applications in magnetism, luminescence, conductivity, gas adsorption, and storage, catalysis, and nano-medicine, attributable to their appealing structures and topologies [1]. Despite the synthesis of various metal–organic complexes, rational control in the synthesis of coordination compounds has been a major challenge to date. Consequently, it is important to study the relationship between ligands and binding modes of metal that construct the complexes. Besides the benefits of using mercury complexes as laxatives, disinfectants, and deworming agents [2], contamination of the atmosphere with mercury ions by combustion of fossil fuel, solid waste incineration, and mining, etc are inevitable [3]. The Hg(II) ion has a strong affinity for thiolate sulfur atom, as the later is a soft donor having large polarizability. In the biological system such as the MerR metalloregulatory protein, cysteine amino acid binds strongly to Hg (II) ion in a trigonal planar geometry *via* the thiolate ions, which is thought to be accountable for detoxification of Hg(II). On account of their biological application [4] and distinctive coordination chemistry, the complexes comprising Hg (II)-thiolate bond were of considerable interest [5]. Cadmium thiolate complexes have been used as templates for thiolate metallo-proteins, such as metallothione, present in the kidneys, and liver [6]. Regardless of its noxious nature, complexes of Cd(II) and Hg(II) still have significant applications in medicine, dentistry, optometry, cosmetics, paint and pigments, pulp and paper industries, and also in batteries [7]. The geometries of Cd(II) and Hg(II) complexes may differ from linear to octahedral or even distorted bipyramidal, hexagonal, and serious distortions from optimal polyhedral coordination can readily occur attributable to adaptable coordination environment [8]. The scope of Cd(II)

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Research paper

Synthesis, characterization, DNA binding ability, in vitro cytotoxicity, electrochemical properties and theoretical studies of copper(II) carboxylate complexes

Maitri Bhattacharjee [a], Smriti Rekha Boruah [d], R.N. Dutta Purkayastha [a,*], Rakesh Ganguly [b,1,*], Debasish Maiti [c], Antonio Franconetti [d], Antonio Frontera [d,*], Alexander M. Kirillov [e,f], Shubhamoy Chowdhury [g], Subhadip Roy [h], Priyatosh Nath [c]

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ABSTRACT

Four copper(II) carboxylate complexes, namely $[Cu_2(\mu\text{-}3,5\text{-dinitrobenzoate-}O,O')_4(4\text{-(dimethylamino)benzaldehyde})_2]$ (**1**), $[Cu_2(\mu\text{-benzoate-}O,O')_4(\text{benzoic acid})_2]$ (**2**), $[Cu_2(\mu\text{-benzoate-}O,O')_4(H_2O)_2]$ $[Cu(\text{benzoate-}O,O')_2(\text{imz})_2]\cdot 2H_2O$ (**3**) and $[Cu(\text{benzoate-}O,O')_2(2\text{-Me-imz})_2]$ (**4**) (imz = imidazole, 2-Me-imz = 2-methyl-imidazole), were synthesized and comprehensively characterized by elemental analysis, spectroscopic methods, single crystal X-ray diffraction, cyclic voltammetry (CV), topological analysis as well as theoretical studies. Single crystal X-ray diffraction revealed that products **1** and **2** are dinuclear paddle-wheel complexes, compound **3** is a co-crystal containing mononuclear and dinuclear blocks, while compound **4** is a mononuclear complex. Hirshfeld surface analysis of the compounds rationalized different types of hydrogen bonds, which also lead to the generation of H-bonded networks in **3** and **4**. Their topological analysis disclosed a uninodal 4-connected 2D layer with sql topology in **3** and a uninodal 2-connected 1D chain with 2C1 topology in **4**. The interaction of **1**–**4** with calf thymus DNA was investigated by UV–visible and fluorescence spectroscopy, revealing a moderately strong non-intercalative mode of interaction. In vitro cytotoxicity study of the complexes on HepG2 (human liver hepatocellular carcinoma) cell lines revealed a significant inhibition activity. Electrochemical study of the complexes in CH_3CN (**1**–**3**) and DMSO (**4**) solution showed a one electron transfer corresponding to Cu(III)Cu(II)/Cu(II)Cu(II) and Cu(II)Cu(II)/Cu(I)Cu(II) redox couples. The ΔE and I_{pa}/I_{pc} values suggest that the redox couples are quasireversible. The DFT study was performed to further rationalize the crystal structures and nuclearity of the obtained copper(II) complexes.

1. Introduction

Copper is a biologically relevant element present as a co-factor in several metalloproteins with enzymatic functions [1]. Its unique redox chemistry based on easily reversible Cu(II)/Cu(I) redox couple is crucial for several biochemical processes [2]. Being involved in various biochemical reactions, copper plays an important role in normal function of cells. As an essential trace element, copper is involved in both

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Bromelain and Olea europaea (L.) leaf extract mediated alleviation of benzo(a)pyrene induced lung cancer through Nrf2 and NFκB pathway

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Affiliations

PMID: 33893581 DOI: 10.1007/s11356-021-13803-y

Abstract

Lung cancer is the most aggressive as well as deadly form of cancer and most of the lung cancer cases are involved in direct smoking or passive smoking. Oxidative stress and pulmonary inflammation regulated by some transcription factors like Nrf2, NF-κB etc. play important roles in lung cancer. Various combinations of therapies are currently attributed to lung cancer treatment. A plethora of evidence supports that the consumption of plant-derived foods can prevent chronic diseases like cancer. Leaves of olive (Olea europaea L.) are rich in phenolic compounds which are having antioxidant and anti-inflammatory property. Also, bromelain from pineapple juice and from pineapple stem is a potent anti-inflammatory agent. We took a pragmatic approach to prevent carcinogenesis by supplementing the combination of these two extracts. In this study, we have tried to evaluate the amelioration of various hallmarks associated with benzo(a)pyrene-induced lung carcinogenesis upon the combinatorial treatment of ethanolic olive leaf extract (EOLE) and bromelain. We have studied the role of EOLE in amelioration of BaP-induced oxidative stress in the lung. As several reports of anticancer activity of bromelain are available, we have combined EOLE with bromelain to study their protective role against BaP-mediated lung damage. Changes in DNA integrity, LPO level in lung after EOLE-treated animal were examined. Then, we have evaluated the synergistic role of EOLE and bromelain. We have found that EOLE in combination with bromelain was able to increase the translocation of Nrf2 from cytoplasm to nucleus and decrease the translocation of NF-κB from cytoplasm to nucleus. Combination of treatment also reduced the expression of TNFα, IL-6, and some matrix metalloproteinases in lung tissue. Our findings suggest that EOLE and bromelain can synergistically reduce the BaP-induced lung carcinogenesis associated with inflammation and oxidative stress via regulating the expression of various inflammatory markers and also modulating the activity of pulmonary antioxidant armories.

Keywords: Bromelain; Inflammation; Lung carcinogenesis; Olea europaea; Oleuropein; Oxidative damage.

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An efficient, scalable, regular clocking scheme based on quantum dot cellular automata

Jayanta Pal, Amit Kumar Pramanik, Jyotirmoy Sil Sharma, Apu Kumar Saha & Bibhash Sen

Analog Integrated Circuits and Signal Processing
107, 659–670 (2021)

Abstract

The present CMOS VLSI technology is facing some challenges like working in nano scale, device density, power dissipation, operating frequency, fast execution, which demands a proper alternative. Quantum dot Cellular Automata (QCA) is one of the feasible substitutes for the same. In QCA, clocking is the primary driving source of power, and the flow of information occurs with the effect of underlying clocking circuitry. But in most of the designs, the proper use of the underlying clocking circuit was circumvented and targeted on random, ineffective clocking, which is a concern of convolution in terms of buildability. On the other hand, wire crossing plays a very critical role in cell layout, as well as the underlying clocking circuit for QCA. In this regard,

Regular clocking scheme based design of cost-efficient comparator in QCA

Jayanta Pal, Mojtaba Noorallahzadeh, Jyotirmoy Sil Sharma, Dhrubajyoti Bhowmik, Apu Kumar Saha, Bibhash Sen

Abstract

Quantum-dot cellular automata (QCA) gained a notable attraction in the emerging nanotechnology to get the better of power consumption, density, nano-scale design, the performance of the present CMOS technology. Many designs had been proposed in QCA for an arithmetic circuit like adder, divider, parity checker and comparator etc. Most of the designs have been facing the challenges of cost efficiency, power dissi-pation, device density etc. However, consideration of design automation, underlying clocking layout and integration of the sub modules are the most important which has a direct impact on the fabrication of the design. This work proposed a novel cost ef-fective and power aware comparator design, which is an essential segment in central processing unit (CPU). The noticeable novelty of the design was the use of underlying regular clocking scheme. A new scalable, regular clocking scheme has been utilized in the coplanar design of the comparator which enables regular or uniform cell layout of QCA circuit. It also exhibited the significant improvement over existing counterparts having irregular clocking in terms of area and latency. QCADesigner was used to test and verify the functionality of the circuit and by using QCAPro the power dissipation has been analyzed.

Keywords

Automata; Comparator; Cost analysis; Power analysis; QCADesigner; QCAPro; Quantum-dot Cellular; Regular clocking

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Research Article

A Novel Design Approach for Beam Bridge Structure Pressure Sensor Base on PZT-5A Piezoelectric

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Abstract

With the spread of the Internet of things, the smart sensors with low power consumption, high sensitivity and can operate in harsh condition are required for various applications. Piezoelectric based sensors are the better as the sensors operate with high linearity with a wide range of mechanical input, and immune to electromagnetic fields and radiations. It is difficult to expedite for developing such sensors as the literature is widely dispersed over many disciplines. In this study, a new approached of mathematical modelling for PZT-5A piezoelectric base bridge structure pressure sensor has been studied. For validation of the mathematical model, a 3D model of a sensor is designed and simulated with the COMSOL multiphysics simulator. Various factors affecting the output voltages and sensitivity of the sensor described in mathematical modelling. Two parts of mathematical modelling consider mechanical modelling and electrostatic modelling. Mechanical modelling enables to analyse the mechanical stress developed on the surface of the sensor. Electrostatic modelling computes various operating modes of the piezoelectric and output voltage of the sensor. Transverse mode of operation for piezoelectric is applicable for bridge structure designed. The electrical equivalent circuit of the sensor is discussed. Comparative studies are done between the mathematical modelling values and simulated output values. From the comparative studies, the output behaviour and various factors affecting the output of a sensor are observed. The sensor mechanical stresses are linear in magnitude with a positive slope to the applied pressures. The sensor output voltages are linear in magnitude with a negative slope to the applied pressures. Tensile stress and negative voltage are developed on the top of the surface. The sensitivities of the sensor are high and the values are -01.957mV/kPa and -1.7 mV/kPa for calculating and simulated respectively.

Keywords: displacement function, neutral plain, operational mode, sensitivities, stress.

1. Introduction

Various types of Micro-Electro Mechanical Systems (MEMS) pressure sensors are developed and many of them are available in the market and mass-produced. For a researcher or designer, it is difficult to expedient in developing the MEMS pressure sensor. Based on the sensing mechanism, there are various types of pressure sensors. They are

(i) Resistive: this sensor is generally piezo-resistive pressure sensor which changes the resistance to deformation [1][2].This sensor has a limitation which sensitivity is reduced because the strain is reduced as the scaling in size of the sensor,
(ii) Capacitive: this sensor changes its electrical capacitance by the deflection of a diaphragm [3][4]. This sensor exhibit a nonlinear as capacitance is inversely proportional between the gaps,
(iii) Inductive: this sensor work on the principle of magnetic field induction [5][6]. The Main limitation is scaling and magnetic interference due to metal,
(iv)Thermal: this sensor work on the principle of change in thermal conductivity due to change in density by measure pressure [7]. The main drawback is system complexity,
(v) Optical: this sensor utilized the concept of Fibre Bragg Gratings [8]. This sensor used when there is a need for high immune to electromagnetic interferences, and
(vi) Piezoelectric: this sensor is working on the principle of piezoelectricity and used for measuring dynamic pressure [9][10][16].

All the sensors are active sensor which requires external power sources, except the piezoelectric sensor, which doesn't require any external power sources. Such piezoelectric sensors remove the struggle of engineers with wires and batteries for monitoring the pressure and it has high sensitivity. These piezoelectric sensors are used for sensing vibration or pressure with low or high frequency. These sensors appear hysteresis as an offset which depends on a field level, cycle time and material used. This hysteresis is considerable for high frequency greater than 1 kHz as heat accumulation aftermeach cycle of operation [11].

Piezoelectricity is the property of certain dielectric material to produce electric charges when mechanical deformation or physically deformed in the presences of electric fields [11]. This phenomenon is due to spontaneous polarization caused by the displacement of electrons relative to the atomic centre, so piezoelectric materials are used for sensing continuous varying physical quantity. Because of this

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A synchronous duty-cycled reservation based MAC protocol for underwater wireless sensor networks

Alak Roy [a], Nityananda Sarma [b]

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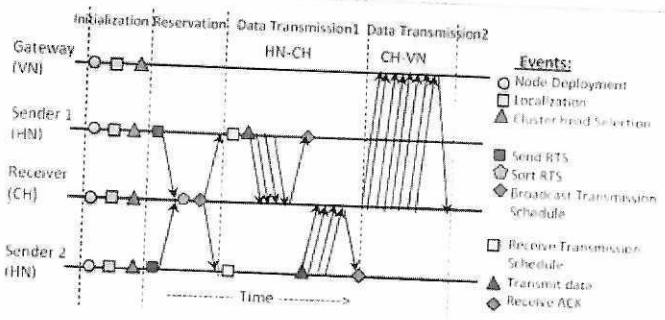
Abstract

To design an energy-efficient Medium Access Control (MAC) protocol for the Underwater Wireless Sensor Networks (UWSNs) is an urgent research issue since depleted batteries cannot be recharged or replaced in the underwater environment. Moreover, the underwater acoustic channels are affected by hindrances such as long propagation delay and limited bandwidth, which appear in the design of the MAC protocol for the UWSNs. The available MAC protocols for the terrestrial wireless sensor networks exhibit low performance in energy efficiency, throughput and reliability in the UWSNs, and cannot be used in the UWSNs directly because of their unique characteristics. This paper proposes a synchronous duty-cycled reservation-based MAC protocol named Ordered Contention MAC (OCMAC) protocol. The basic mechanism of this protocol is to schedule data transmission by transmitters through the scheduling of Ready To Send (RTS) frames. The protocol eliminates the possible collision during data transmission and improves communication efficiency. The paper analyzes the performance in energy efficiency, throughput and reliability of the protocol by modeling the queuing behavior of OCMAC with a Markov Chain process. Furthermore, the analytical model is validated through a simulation study. The analysis results demonstrated that while providing good throughput and reliability, OCMAC can achieve energy saving.

Graphical abstract



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Authorship and Collaboration Pattern of Annals of Library and Information Studies Journal during 2009-2018: Scientometrics Mapping

Das S.[a], Verma M.K.[b]

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Abstract

This paper presents a scientometric analysis of the journal titled Authorship and Collaboration Pattern of Annals of Library and Information Studies Journal during 2009-2018: Scientometrics Mapping. The analysis focused on the distribution pattern of articles, author's productivity, collaboration pattern and Collaborative coefficient and citation impact over time. It showed that the highest 12.57% of articles were published in the year 2010. The majority of articles are double authored with 47.03% of the total contribution. The degree of collaboration among the authors was found 0.66, which means collaborated papers are increasing. Total 2886 citations were appended where the highest number of 704 citations was appended in the starting year 2009 having 20.71 citations per paper.

Author keywords

ALIS journal; Annals of Library and Information Studies; Authorship pattern; Bibliometric; Co-authorship Index; Modified collaborative co-efficient; Scientometric

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Citation analysis of Mathematics: a scientometric study based on PhD theses, Tripura University

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Abstract

Citation analysis of theses helps in evaluating research performance of departments and universities. The aim of the present study is to evaluate the theses available in Central library, Tripura University from the department of Mathematics. Theses available in the central library for the period of ten years from 2007 to 2016 constitute the sample as the university was converted to central university in 2007. The authorship pattern of the articles was measured with collaborative measures. Bradford law and Leimkuhler model were tested against the dataset. It was revealed that the journals are the most preferred type of documents having the share of 82.07%. Until 1950, single authored papers were dominating and in the recent decades the trend is seen to be shifting towards large group collaborations. The dataset did not fit well against Bradford's law of scattering. However, we acknowledge the acceptability of modified Bradford's distribution given by the Leimkuhler model. The results revealed should assist the researchers in the area of Mathematics in improved understanding the characteristics of the field.

Author keywords

Bradford's law; Citation Analysis; PhD theses; Scientometrics; Tripura University

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A Scientometrics analysis of Ovarian Cancer Research during 2010 to 2019: with special reference to South Asian contribution

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Abstract

A scientometrics analysis of Ovarian cancer research during 2010 to 2019 is performed in this study. It is an attempt to find out the various scientometrics indicators such as: type of document wise distribution, authorship pattern, year wise publication, Co-occurrence of keyword. A total of 927 bibliographic records were collected from web of science database and as a data source it has been analyzed using MS excel and VOS viewer software. Kumar, S from University of Birmingham is found to be the most productive author. Multi-authorship is found to be dominant in this area of research. South Asia countries have been chosen as an area of the study and the countries that make up south Asia are Sri Lanka, Pakistan, Bangladesh, Nepal, India, Bhutan, Afghanistan and Maldives © 2021, Library Philosophy and Practice. All Rights Reserved.

Author keywords

Neoplasms; Ovarian Cancer; Scientometrics; Web of Science (wos) and VOSviewer

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Publication and Collaboration Pattern of College and Research Libraries Journal during 2009–2018: A Scientometric Analysis

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Abstract

This paper presents a scientometric analysis of the journal titled College and Research Libraries for the period between 2009 to 2018. The analysis focused on the distribution pattern of articles, the author's productivity, collaboration pattern and Collaborative coefficient, Relative Growth rate and doubling time. It showed that the highest 14.47% of articles were published in the year 2015. The majority of articles are singled authored with 35.02% of the total contribution. The degree of collaboration among the authors was found decent, the average growth rate was in an upward direction from beginning to latest years. Total 14942 citations were appended where the highest number of 2464 citations was appended in the year 2018 having 51.33 citations per paper. © 2021. All Rights Reserved.

Author keywords

Authorship Index; Authorship pattern; Bibliometric; College and research libraries; Doubling time; Modified collaborative co-efficient; Relative growth rate; Scientometric

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Authorship Collaboration and visualization on Detention Center Research: A Scientometric study

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Digital library research in brics countries during 2000-2019: A scientometric analysis

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Abstract

The study examines 1220 digital library research papers published by BRICS countries during the period 2000 to 2019. Bibliographic data on the research papers were collected from Web of Science database. It is found that maximum number of publications (225) were two-authored. The Degree of collaboration is 0.84, collaborative index is 4.14, the collaboration co-efficient is 0.59 and the modified collaboration co-efficient is 0.61. Among all the BRICS countries, China has contributed the most number of papers [690 (56.58%)] followed by India with 205 (16.80%) contributions. Lotka's law was not found to fit with the observed author's productivity of the study. The study concludes that there is increased research on digital library in BRICS countries.

Author keywords

Authorship index; Authorship pattern; Bibliometrics; BRICS countries; Digital libraries; Electronic libraries; Lotka's law; Modified collaborative co-efficient; Scientometrics; Virtual libraries

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ON I-STATISTICALLY LIMIT POINTS AND I-STATISTICALLY CLUSTER POINTS OF SEQUENCES OF FUZZY NUMBERS

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Abstract

The main aim of this paper is to introduce I-st limit points and I-st cluster points of a sequence of fuzzy numbers and also study some of its basic properties. Conditions for a I-st limit point of a I-st cluster point are investigated.

Author keywords

Cluster point; Fuzzy number; Ideal; Limit point

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Statistical Convergence of Order α for Complex Uncertain Sequences

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Abstract

In this paper, we introduce convergence concepts namely, statistical convergence of order α, statistical convergence of order α almost surely, statistical convergence of order α in measure, statistical convergence of order α in mean, statistical convergence of order α in distribution in complex uncertain theory. We also investigate some relationships among them. © 2021 World Scientific Publishing Company.

Author keywords

complex uncertain variable; Statistical convergence of order α; uncertainty theory

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On I-statistically ϕ-convergence

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Abstract

In this paper we investigate the notion of ¡-statistical ϕ-convergence and introduce I_s-ϕ limit points and I_s-ϕ cluster points of real number sequence and also studied some of its basic properties. © 2021 Shyamal Debnath and Chiranjib Choudhury. All Rights Reserved.

Author keywords

I_s-ϕ limit point; I_s-ϕ cluster point; I_s-ϕ statistically convergent

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Statistical convergence of multisequences on $\mathbb{R}$

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Abstract

The main aim of this paper is to introduce the statistical convergence of multisequences on $\mathbb{R}$ and study some basic algebraic and topological properties of a multisequence. © Balkan Society of Geometers, Geometry Balkan Press 2021.

Author keywords

multisequence; Multiset; statistical convergent; statistical limsup

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University of New Mexico

Pentapartitioned Neutrosophic Q-Ideals of Q-Algebra

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Abstract: In this paper we procure the idea of pentapartitioned neutrosophic Q-ideal of Q-algebra. Here we formulate some definitions and results on it. Further, we furnish some suitable examples.

Keywords: *Pentapartitioned Neutrosophic Set; PN-Q-Algebra; PN-Q-Ideal; PN-Q-Sub-Algebra.*

1. Introduction

Iseki and Tanaka [15] presented the concept of BCK-algebra in the year 1978. Later on, Negger and Kim [26] established the notion of d-algebra by extending the idea of BCK-algebra. In the year 1999, Negger et al. [25] defined the d-ideal in d-algebra. The notion of fuzzy set (FS) theory was established by Zadeh [28] in the year 1965. Thereafter, Atanassov [4] introduced the idea of intuitionistic fuzzy set (IFS) theory by generalizing the concept of FS. In the year 2013 F. Smarandache [27] extended the neutrosophic set to refined [n-valued] neutrosophic set, and to refined neutrosophic logic, and to refined neutrosophic probability. The notion of fuzzy d-ideals of d-algebras was studied by Jun et. al. [17] in the year 2000. The idea of intuitionistic fuzzy d-algebra was presented by Jun et al. [16]. In the year 2017, the concept of intuitionistic fuzzy d-ideal of d-algebra was introduced by Hasan [12]. Hasan [13] also studied the intuitionistic fuzzy d-filter of d-algebra. The notion of Q-algebra was grounded by Neggers et. al. [24] in the year 2001. Thereafter, Abdullah and Jawad [1] studied some new types of ideals in Q-algebra. Mostafa et. al. [22] introduced the notion of fuzzy Q-ideals in Q-algebras. Mostafa et. al. [23] also studied the intuitionistic fuzzy Q-ideals of Q-algebra. In the year 2005, Smarandache [27] grounded the idea of

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Topology on Quadripartitioned Neutrosophic Sets

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Abstract: The focus of this paper is to introduce the notion of quadripartitioned neutrosophic topology (Q-NT) on quadripartitioned neutrosophic sets (Q-NS). In this paper, we define quadripartitioned neutrosophic closure, quadripartitioned neutrosophic interior operator of Q-NSs in quadripartitioned neutrosophic topological space (Q-NTS) and investigate several properties of them. Again, we introduce quadripartitioned neutrosophic semi-open (Q-NSO) set, quadripartitioned neutrosophic pre-open (Q-NPO) set, quadripartitioned neutrosophic *b*-open (Q-N *b*-O) set, and quadripartitioned neutrosophic α-open (Q-Nα-O) set in Q-NTSs. Further, we furnish some suitable examples and prove some basic results on Q-NTS.

Keywords: *Quadripartitioned Neutrosophic Set; Q-NT; Q-NTS; Quadripartitioned-Neutrosophic Closure; Quadripartitioned-Neutrosophic Closure; Q-NPO; Q-Nα-O.*

1. Introduction: In the year 2005, Smarandache [20] extended the concept of intuitionistic fuzzy set by introducing the notion of neutrosophic set (NS). Later on, many researchers use NS in their theoretical and practical research. In the year 2016, Chatterjee et. al. [4] grounded the idea of quadripartitioned neutrosophic set and defined several similarity measures between two quadripartitioned neutrosophic sets. The idea of neutrosophic topological space (NTS) was presented by Salama and Alblowi [18] in the year 2012. The neutrosophic semi-open mappings are studied by Arokiarani et. al. [2]. Afterwards, Iswaraya and Bageerathi [11] studied the concept of neutrosophic semi-open sets and neutrosophic semi-closed sets. Pushpalatha and Nandhini [15] grounded the idea of neutrosophic generalized closed sets in NTSs. The notion of neutrosophic *b*-open sets in NTSs was presented by Ebenanjar et al. [10]. Rao and Srinivasa [17] grounded the concept of pre open set and pre closed set via neutrosophic topological spaces. Thereafter, Maheswari et. al. [13] studied the neutrosophic generalized *b*-closed sets in NTSs. In the year 2019, Mohammed Ali Jaffer and Ramesh [14] studied the concept of neutrosophic generalized pre-regular

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Identification of the Most Significant Risk Factor of COVID-19 in Economy Using Cosine Similarity Measure under SVPNS-Environment

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Abstract: In this article, we procure the idea of single-valued pentapartitioned neutrosophic cosine similarity measure (SVPNCSM) and single-valued pentapartitioned neutrosophic weighted cosine similarity measure (SVPNWCSM) under the single-valued pentapartitioned neutrosophic set (SVPNS) environment. Besides, we formulate several interesting results on SVPNCSM and SVPNWCSM of similarities between two SVPNSs. Further, we present a multi-attribute decision-making (MADM) model under SVPNS environment using the SVPNCSM. Finally, we provide a numerical example to show the applicability and effectiveness of our proposed MADM technique.

Keywords: *Neutrosophic Set; Similarity Measure; SVPNS; COVID-19.*

1. Introduction:

In 1965, Late Prof. L.A. Zadeh grounded the concept of fuzzy set theory to deal with the problems having uncertainty. In a fuzzy set, every element has a degree of membership lies between 0 and 1.

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Generalized fuzzy closed sets in a fuzzy bitopological space via γ -open sets

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Abstract

The paper presents the notion of (i,j)*γ-generalized fuzzy closed set in a fuzzy bitopological space considering a parallel form of (i,j) fuzzy γ-open set. We introduce the idea of γ-generalized fuzzy q-neighbourhood of a fuzzy point. Moreover, we study various related properties and cite some interesting results on this set. Also, we show that generalized fuzzy closed sets and γ-generalized fuzzy closed sets are completely independent of each other in the same environment. Furthermore, we introduce the notion of γ-generalized fuzzy continuous function in a fuzzy bitopological space. Finally, we propose a new type of closure operator and establish important results based on this concept. © 2020, African Mathematical Union and Springer-Verlag GmbH Deutschland, ein Teil von Springer Nature.

Author keywords

(i, j)* generalized fuzzy continuous function; (i, j)* γ-generalized fuzzy closure operator; (i, j)*γ-generalized fuzzy closed set; (i, j* γ-generalized fuzzy continuous function

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New Mathematics and Natural Computation | Vol. 17, No. 01, pp. 91-103 (2021)

On a New Class of Complex Uncertain Sequences Related to the $\ell_p(\Gamma)$ Space

Pyari Debnath and Binod Chandra Tripathy

https://doi.org/10.1142/S1793005721500058 Cited by: ...

Vol. 17, No. 01

Abstract

The aim of this paper is to introduce the complex uncertain sequence space $m(\phi, \Gamma)$ related to the $\ell_p(\Gamma)$ space. We have introduced the space $m(\phi, \Gamma)$ of almost surely, in measure, in mean, in distribution and uniformly almost surely. Also we have studied them different properties.

Keywords: Complex uncertain sequence | p-absolutely summable | almost sure convergent | convergent in measure | convergent in mean | convergent in distribution

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Volume 499, Issue 2, 15 July 2021, 125017

Note

On Riesz mean of complex uncertain sequences

Sangeeta Saha [a] ✉, Binod Chandra Tripathy [b] ✉, Santanu Roy [a] ✉

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https://doi.org/10.1016/j.jmaa.2021.125017

Abstract

In this paper, we have developed the idea of Riesz mean, Riesz convergent in measure and Riesz convergent almost surely in complex uncertain variables. Also, we have established some relationships.

Previous Next

Keywords

Complex uncertain variable; Riesz mean; Riesz convergent in measure; Riesz convergent almost surely

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Applications of statistically probability convergence to approximation theorem
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On Generalized Difference Ideal Convergence in Generalized Probabilistic n-normed Spaces

Binod Chandra Tripathy, Mausumi Sen & Soumitra Nath

Proceedings of the National Academy of Sciences, India Section A: Physical Sciences **91**, 29–34 (2021)

Abstract

In this article, we introduce the concept of $\Delta^m - I$-convergent and $\Delta^m - I$ Cauchy sequences in generalized probabilistic n-normed spaces and establish some results relating to this concept. We also study $\Delta^m - I^*$ convergence in the same space. *Statement* Probabilistic norm generalizes and unifies different notions of norm, represented by a distance function, rather than a positive real number. Ideal convergence unifies many notions of convergence of sequences. In this article, we have introduced the notion of generalized difference ideal convergent sequences in probabilistic n-normed space, which generalizes and unifies many existing notions. Hence, the results of this article have been established in general setting.

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Lacunary sequences of complex uncertain variables defined by Orlicz functions

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DOI:

https://doi.org/10.22199/issn.0717-6279-2021-02-0021

Keywords:

Almost convergent sequences, Complex uncertain variable, Orlicz function, Lacunary sequence

Abstract

Using the concept of Orlicz function and uncertainty theory, some new class of lacunary convergent sequences defined by Orlicz functions have been introduced with the lacunary convergence concepts in this paper. Some topological properties of the defined sequence spaces along with the inclusion relations have been investigated.

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Malaysian Journal of Mathematical Sciences 15(1): 91–108 (2021)

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Lacunary Convergence of Sequences of Complex Uncertain Variables

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ABSTRACT

This paper introduces the notion of strongly Cesàro summable sequences, the sequences of uniformly strongly Cesàro summable and the strong almost convergent sequences of complex uncertain sequences. A study on the lacunary strong convergence concepts of sequences of complex uncertain variables of different types have also been done.

Keywords: Almost convergence, Cesàro summable sequences, complex uncertain variable, uncertainty theory.

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RESEARCH ARTICLE

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Almost Convergence of Complex Uncertain Triple Sequences

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Received: 4 November 2019 / Revised: 16 August 2020 / Accepted: 21 October 2020 / Published online: 13 November 2020

Abstract In this paper, we present the concept of complex uncertain triple sequences and study almost convergence therein. Almost convergence with respect to all five aspects in uncertain space, viz., almost convergence in mean, measure, distribution, almost surely and uniformly almost surely, are initiated and interrelationships among them are established. We have also studied almost Cauchy triple sequence of complex uncertain variables and established some results. It is known that every convergent sequence is a Cauchy sequence but the converse is not true in general. But taking complex uncertain variables in triple sequences, we find that a complex uncertain triple sequence is an almost Cauchy sequence if and only if it is almost convergent.

Statement In this article we have introduced and investigated almost convergence of triple sequences of complex uncertain variables. Studies on complex uncertain sequences has been initiated in the last decade. Now it is drawing attention of researcher and this article will motivate for further investigation and application.

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Keywords Complex uncertain triple sequence · Complex uncertain Variable · Almost convergence in mean · Almost convergence in measure · Almost surely Cauchy sequence

Mathematics Subject Classification 60B10 · 60B1 · 60E05 · 60F25 · 40A05 · 40A30 · 40D25 · 40F05

1 Introduction

The theory of uncertainty is first introduced by Liu [1]. After that, it has been studied in various fields of mathematics like calculus [2], risk and stability analysis [3], set theory [4], logic [5], process [6], finance [7], graph theory [8], sequence and series [1]. It became a separate branch of mathematics, and nowadays, the research on uncertainty theory became quite famous. Convergence of sequences plays a pivotal role in the study of fundamental theory of mathematics [9–11]. Liu applied the theory of uncertainty on sequences and established the properties of convergence of uncertain measure by introducing convergence in measure, in mean, in distribution and in almost surely of an uncertain sequence. You [12] extended this study to convergence in uniformly almost surely and established the interrelationship with the previous four types of convergence. Guo and Xu [13] presented a necessary and sufficient condition of convergence in mean square for uncertain sequences via Cauchy sequence. Cheng et. al [14] studied the concept of convergence of uncertain sequences taking complex uncertain variables which was introduced by Peng [15]. Datta and Tripathy [16] studied convergence of complex uncertain double sequences.

In this paper, we introduce triple sequence of complex uncertain variable and study almost convergence in

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Pairwise Neutrosophic *b*-Continuous Function in Neutrosophic Bitopological Spaces

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Abstract: The main focus of this article is to procurethe notions of pairwise neutrosophic continuous and pairwise neutrosophic *b*-continuous mappings in neutrosophic bitopological spaces. Then, we formulate some results on them via neutrosophic bitopological spaces.

Keywords: Neutrosophic Topology; Neutrosophic Bitopology; Pairwise Neutrosophic*b*-Interior; Pairwise Neutrosophic *b*-Closure; Pairwise Neutrosophic Continuous.

1. Introduction

Zadeh [31] presented the notions of fuzzy set (in short FS) in the year 1965. Afterwards, Chang [4] applied the idea of topology on fuzzy sets and introduced the fuzzy topological space. In the year 2017, Dutta and Tripathy [15] studied on fuzzy *b*-θ open sets via fuzzy topological space. Later on, Smarandache [23] grounded the idea of neutrosophic set (in short N-set) in the year 1998, as anextension of the concept of intuitionistic fuzzy set (in short IF-set) [3], where every element has threeindependent memberships values namely truth, indeterminacy, and false membership values respectively. Afterwards, Salama and Alblowi [21] applied the notions of topology on N-sets and introduced neutrosophic topological space (in short NT-space) by extending the notions of fuzzy topological spaces. Salama and Alblowi [22] also defined generalized N-set and introduced the concept of generalized NT-space. Later on, Arokiarani et al. [2] introduced the ideas of neutrosophic point and studied some functions in neutrosophic topological spaces. The notions of neutrosophic pre-open (in short NP-O) and neutrosophic pre-closed (in short NP-C) sets via NT-spaces are studied by Rao and Srinivasa [20]. The idea of *b*-open sets via topological spaces was established by Andrijevic [1]. Afterwards, Ebenanjar et al. [16] presents the concept of neutrosophic *b*-open set (in short N-*b*-O-set) via NT-spaces. In the year 2020, Das and Pramanik [8] presents the generalized neutrosophic *b*-open sets in NT-spaces. The notions of neutrosophic Φ-open set and neutrosophic Φ-continuous functions via NT-spaces was also presented by Das and Pramanik [9]. The concept of neutrosophic simply soft open set in neutrosophic soft topological space was studied by Das and Pramanik [10]. In the year 2021, Das and Tripathy [14] presented the notions of neutrosophic simply *b*-open set via NT-spaces. In the year 2020, Das and Tripathy [12] grounded the notions of neutrosophic multiset and applied topology on it. In the year 2021, Das et al. [5] studied the concept of quadripartitioned neutrosophic topological spaces. The notion of bitopological space was introduced by Kelly [17] in the year 1963. In the year 2011, Tripathy and Sarma [26] studied on *b*-locally open sets via bitopological spaces. The idea of pairwise *b*-locally

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Tangent Similarity Measure Based MADM-Strategy under SVPNS-Environment

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Abstract: The main focus of this article is to procure a new similarity measure namely tangent similarity measure for single valued pentapartitioned neutrosophic sets (SVPNS). We formulate some results on tangent similarity measure of similarities between two SVPNSs. Then, we develop a SVPNS-MADM (SVPNS-Multi-Attribute-Decision-Making) model under the SVPNS environment based on the tangent similarity measure. Further, we validate our proposed SVPNS-MADM model by giving a numerical example.

Keywords: MADM; Pentapartitioned Neutrosophic Set; Tangent Similarity.

1. Introduction:

In the year 1965, Zadeh [37] introduced the concept of fuzzy set (FS) theory to deal with the uncertainty events. Afterwards, Atanassov [1] exended the concept of FS by introducing the notions of intuitionistic fuzzy set (IFS). In the year 2011, Pramanik and Mukhopadhyaya [28] proposed a MADM approach based on grey relational analysis under intuitionistic fuzzy set-environment. In the year 2014, Mondal et al. [20] developed a MADM-strategy to select the quality brick under intuitionistic fuzzy environment. In the year 1998, Smarandache [30] grounded the idea of neutrosophic set (NS) by extending the notion of fuzzy set (FS) and intuitionistic fuzzy set (IFS) to deal with the uncertainty events having indeterminacy. In an NS, every element has three independent components namely truth, indeterminacy, and false membership values. Thereafter, Salama and Alblowi [29] applied the notions of topology on NSs and introduced the concept of neutrosophic topological space (NTS). Later on, many researchers around the globe gives their contributions ([6], [7], [12], etc.] in the area of NTS. Indeterminacy membership plays an important role in multi-attribute-decision-making problems of real world. In the year 2010, Wang et al. [31]

Relationships between statistical convergence concepts of complex uncertain sequences

S. Saha, B. C. Tripathy, S. Roy

Abstract. In this paper, a new kind of convergence of complex uncertain sequence is presented, statistically convergent in $p-$distance and statistically convergent completely. We have also establish relationships between statistically convergent completely, statistically convergent in $p-$distance, statistically convergence in measure, statistically convergence in distribution, statistically convergence uniformly almost surely and statistically convergence almost surely.

M.S.C. 2010: 60B10, 60B12, 60F05, 60F17, 40A05, 40A35.
Key words: Complex uncertain variables; statistical convergence; statistically convergent completely; statistically convergent in $p-$distance.

1 Introduction

In the absence of samples required to estimate a probability distribution, some domain experts are invited to calculate or assess the belief degree of the eventuality of each event. According to some theorists, the belief degree must be modelled by subjective probability or fuzzy set theory. But there is a chance that both of these theories may lead to counterintuitive results in this case. Therefore, both their uses are inappropriate. To solve those problems, uncertainty theory was founded by Liu [3]. This theory rationally deals with personal belief degrees. In recent time, uncertainty theory has evolved as a special branch of mathematics. Up to now, uncertainty theory has been studied from different directions by You [12], You and Yan [13, 14], Zhang [15] and many others. Since the convergence of sequences plays an important part in the fundamental theory of mathematics, Liu [3] provided some convergence concepts of uncertain sequences and discussed their relationships. Peng [5] developed the new concepts of complex uncertain variables. After that, Chen *et al.* [1] introduced the convergence of complex uncertain sequence and many others, like Tripathy and Nath [11], Nath and Tripathy [4], Saha *et al.* [8, 9] and Roy *et al.* [6] developed this concept according to their different requirements of measurability. There is an extension of convergence of sequence, which is statistical convergence. The details about the statistical convergence of a sequence have been discussed in the articles of Šalát [7], Fridy [2] and Tripathy [10]. Until now, complex uncertain variables have

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Lacunary Convergence of Double Sequences of Complex Uncertain Variables

Pranab Jyoti Dowari and Binod Chandra Tripathy

Abstract

In this paper, we introduce the notion of lacunary convergence for double sequences of complex uncertain variables. We have established the relation between lacunary convergence and strong Cesàro convergence. Also, we have established the relation between different concepts of lacunary convergence of double sequences of complex uncertain variables.

Keywords: Double sequence · complex uncertain variable · lacunary convergence · strong Cesàro convergence · convergence in mean · convergence in measure

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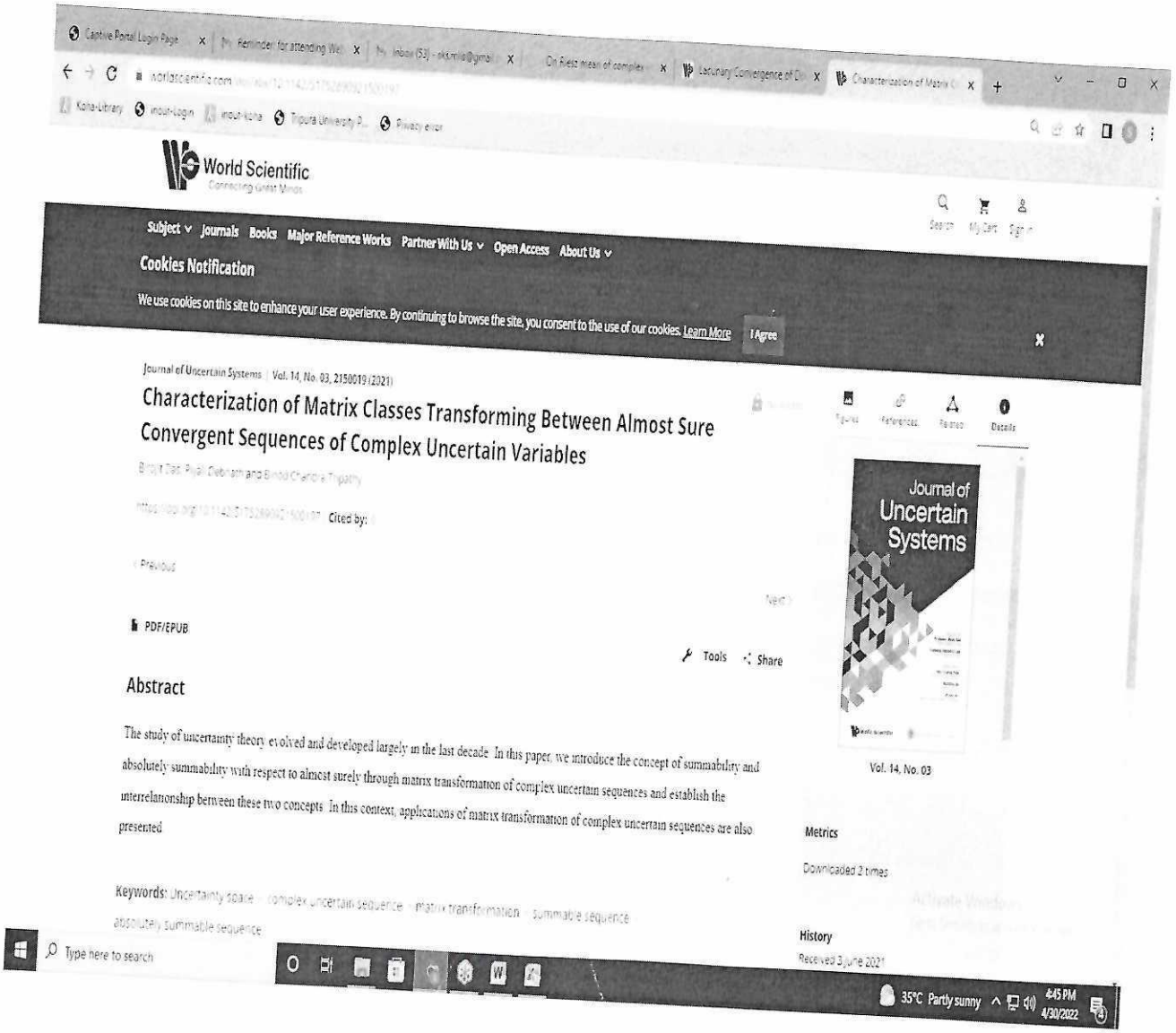

Journal of Uncertain Systems | Vol. 14, No. 03, 2150019 (2021)

Characterization of Matrix Classes Transforming Between Almost Sure Convergent Sequences of Complex Uncertain Variables

Bipul Das, Pinaki Debnath and Binod Chandra Tripathy

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Abstract

The study of uncertainty theory evolved and developed largely in the last decade. In this paper, we introduce the concept of summability and absolutely summability with respect to almost surely through matrix transformation of complex uncertain sequences and establish the interrelationship between these two concepts. In this context, applications of matrix transformation of complex uncertain sequences are also presented.

Keywords: Uncertainty space; complex uncertain sequence; matrix transformation; summable sequence; absolutely summable sequence.

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Difference Double Sequence of Complex Uncertain Variables Defined by Orlicz Function

Debasish Datta and Binod Chandra Tripathy

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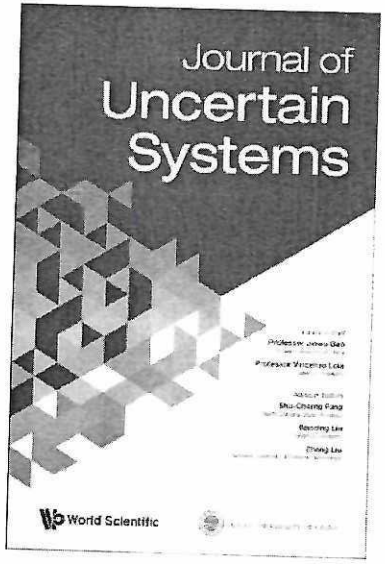
Abstract

In this paper, we introduce the difference double sequence of complex uncertain variables defined by Orlicz function. We study some of their properties like solidness, symmetricity, and completeness and prove some inclusion results.

Keywords: Uncertainty ▪ complex uncertain variable ▪ Orlicz function ▪ completeness ▪ almost sure convergence ▪ solid



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Almost Convergence of Complex Uncertain Double Sequences

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Abstract. Convergence of real sequences, as well as complex sequences are studied by B. Liu and X. Chen respectively in uncertain environment. In this treatise, we extend the study of almost convergence by introducing double sequences of complex uncertain variable. Almost convergence with respect to almost surely, mean, measure, distribution and uniformly almost surely are presented and interrelationships among them are studied and depicted in the form of a diagram. We also define almost Cauchy sequence in the same format and establish some results. Conventionally we have, every convergent sequence is a Cauchy sequence and the converse case is not true in general. But taking complex uncertain variable in a double sequence, we find that a complex uncertain double sequence is a almost Cauchy sequence if and only if it is almost convergent. Some suitable examples and counter examples are properly placed to make the paper self sufficient.

1. Introduction

In real life, uncertainty not only appears in real quantities but also in complex quantities. Uncertainty theory is inevitable to quantify the future when no data is available, to asses the future when an emergency like war, flood, earthquake arises or the past when counting precise observations or performing measure is nearly impossible, to model non-jagged concepts (for example, tall, young) and dynamical systems with continuous time noise. Liu [5] introduced the notion of uncertain variable as a function from a measurable space to $\mathbb{R}$ and when $\mathbb{R}$ is replaced by the set of complex numbers, it is called complex uncertain variable due to Peng [18]. In the same work, he also initiated the notion of complex uncertain distribution and expected value for the purpose of measure of a complex uncertain variable. Now-a-days the works on uncertainty theory is being explored in almost every field of mathematics, viz. uncertain logic [6] (Liu), uncertain process [7](Liu), uncertain inference [8](Liu), uncertain calculus [9] (Liu), uncertain risk and reliability analysis [10] (Liu), uncertain graph [17](Gao, Gao), uncertain finance [9](Liu) [15](Chen) and many more.

Convergence of sequences [3, 4, 13] plays a pivotal role in the study of fundamental theory of mathematics and so Liu [5] applied the theory of uncertainty on sequences. He established the properties of convergence of uncertain measure by introducing convergence in measure, in mean, in distribution and in almost surely

2010 *Mathematics Subject Classification.* 60B10, 60B1, 60E05, 60F25, 40A05, 40A30,40D25, 40F05
Keywords. Complex uncertain double sequence, Complex uncertain Variable, Almost convergence in mean, Almost convergence in measure, Almost surely Cauchy sequence.
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ALMOST M-PRECONTINUOUS FUNCTIONS IN BIMINIMAL STRUCTURE SPACES

ANJALU ALBIS BASUMATARY[1], DIGANTA JYOTI SARMA[2] AND BINOD CHANDRA TRIPATHY[3]

ABSTRACT. In this article, we define almost M-Precontinuous functions in biminimal structure spaces by using the concept of M-preopen sets. We have investigated some properties. We have proved some equivalent relations between some properties. We have studied the relationship of this type of functions with some other various existing functions together with δ-open sets.

1. INTRODUCTION

The concept of minimal spaces has been introduced by Maki et al.[4]. Popa and Noiri [6] introduced the notion of M-continuous functions in minimal spaces and studied some of its properties. Min and Kim [5] explored the notion of m-preopen sets and M-Precontinuous functions in minimal spaces and obtained several characterisations. Boonpok [1] introduced the concept of biminimal structure spaces by taking two minimal structures on a non-empty set. Boonpok [2] introduced the idea of M-preopen sets and studied the notion of M-Precontinuous and weakly M-Precontinuous functions in biminimal structure spaces. It is found that Carpintero et al. [3] had introduced and characterized the concept of m-preopen sets and their related notions in

2010 *Mathematics Subject Classification.* 54A05; 54A10; 54C08.
Key words and phrases. Biminimal structure spaces; $M_{ij(X)}$-preopen; $M_{ij(X)}$-preclosed; $M_{ij(X)}$-δ-open; $M_{ij(X)}$-regular open.

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Neutrosophic Simply b-Open Set in Neutrosophic Topological Spaces

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DOI: https://doi.org/10.24996/ijs.2021.62.12.21

Keywords: Neutrosophic simply b-open, Neutrosophic simply b-closed, Neutrosophic b-compact, Neutrosophic simply b-compact

Abstract

In this paper, we procure the notions of neutrosophic simply *b*-open set, neutrosophic simply *b*-open cover, and neutrosophic simply *b*-compactness via neutrosophic topological spaces. Then, we establish some remarks, propositions, and theorems on neutrosophic simply

b-compactness. Further, we furnish some counter examples where the result fails.

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Pentapartitioned Neutrosophic Topological Space

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Binod Chandra Tripathy

Keywords: Neutrosophic Set, Pentapartitioned Neutrosophic Set, P-NPO, P-NSO, P-N-b-O, P-N -O

Abstract

The main focus of this study is to present the notions of pentapartitioned neutrosophic topological space. We introduce the notions of closure and interior operator of pentapartitioned neutrosophic sets in pentapartitioned neutrosophic topological space, and investigate some of their basic properties. Further, we define pentapartitioned neutrosophic pre-open (in short P-NPO) set, pentapartitioned neutrosophic semi-open (in short P-NSO) set, pentapartitioned neutrosophic b-open (in short P-N-b-O) set and pentapartitioned neutrosophic -open (in short P-N -O) set via pentapartitioned neutrosophic topological spaces. By defining P-NPO set, P-NSO set, P-N-b-O set, P-N -O set, we furnish some suitable examples and formulate some basic results on pentapartitioned neutrosophic topological spaces.

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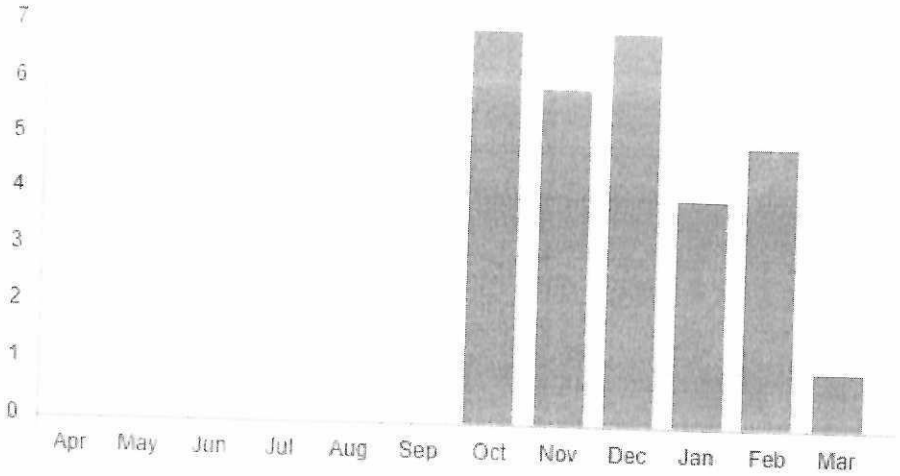

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Neutrosophic Supra Simply Open Set and Neutrosophic Supra Simply Compact Space

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Abstract: The aim of this article is to procure the notions of neutrosophic supra simply open set, neutrosophic supra simply open cover, neutrosophic supra simply compactness via neutrosophic supra topological spaces. Further, we formulate some results in the form of remarks, theorems, propositions etc.

Keywords: *Neutrosophic Supra Simply Open; Neutrosophic Supra Simply b-Open; Neutrosophic Supra Compact; Neutrosophic Supra Simply compact.*

1. Introduction

Smarandache [30] grounded the notion of neutrosophic set (in short NS) in the year 1998 by extending the concept of intuitionistic fuzzy set [1]. In the year 2010, Wang et al. presented the idea of single valued neutrosophic set. Till now, many researchers around the globe applied the notions of NS and its extensions in the formation of MADM-algorithms [3, 6, 10, 18, 21, 22, 24, 25, etc.]. In the year 2012, Salama and Alblowi [28] established the idea of neutrosophic topological space (in short NTS). Further, Salama and Alblowi [29] presented generalized NS and generalized NTS. The concept of neutrosophic semi-closed set and neutrosophic semi-open set in NTSs was introduced by Iswaraya and Bageerathi [16]. Afterwards, Arokiarani et al. [2] grounded the idea of neutrosophic semi-open functions and established relation between them. The concept of generalized neutrosophic closed sets in NTSs was studied by Dhavaseelan, and Jafari [14]. The neutrosophic generalized closed sets in NTSs was established by Pushpalatha and Nandhini [26]. Thereafter, Ebenanjar et al. [15] presented the neutrosophic b-open sets in NTSs. In the year 2018, Maheswari et al. [19] grounded the idea of neutrosophic generalized b-closed sets in NTSs. In the year 2020, Das and Pramanik [7] introduced the notion of generalized neutrosophic b-open sets in NTSs. Das and Pramanik [8] also established the concept of neutrosophic Φ-open sets and neutrosophic Φ-continuous functions. Mallick and Pramanik [20] introduced the notions of pentapartitioned neutrosophic set and studied their several properties. Later on, Das et al. [5] presented the idea of pentapartitioned neutrosophic Q-ideals of Q-algebra. In the year 2021, Das et al. [4] grounded the notions of quadripartitioned neutrosophic topological space. Noori and Yousif [23] introduced the idea of soft simply compact space via soft topological spaces in the year 2020. Afterwards, Das and Pramanik [9] presented the concept of neutrosophic simply soft open set in neutrosophic soft

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SVPNS-MADM strategy based on GRA in SVPNS Environment

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Abstract: In the present study, we present a multi-attribute-decision-making (MADM) strategy in Single Valued Pentapartitioned Neutrosophic Set (SVPNS) environment based on Grey Relational Analysis (GRA) which we call SVPNS- MADM strategy. We define Hamming distance between two single valued pentapartitioned neutrosophic sets and prove its basic properties. The notion of pentapartitioned neutrosophic set is a powerful mathematical tool to deal with incomplete, indeterminate, ignorance, and inconsistent information. In this paper, we extend the neutrosophic GRA strategy to pentapartitioned neutrosophic GRA strategy. Then we employ it to an MADM strategy. Further, we demonstrate the developed MADM strategy by solving an illustrative numerical example that reflects the efficiency and applicability of the proposed strategy.

Keywords: Neutrosophic set, Single valued neutrosophic set, Pentapartitioned neutrosophic set; Multi attribute decision making, Grey relational analysis.

1. Introduction

The idea of neutrosophic set (NS) was presented by Smarandache [38], which was a powerful mathematical tool to deal with incomplete, indeterminate, and inconsistent information. The notion of NS and its various extensions have been successfully applied in the many fields such as decision making [1-13, 16-19, 21, 25-31, 36-38, 43, 45], medical diagnosis [32-33, 44], data mining [20], conflict resolution [35], etc. In the recent past, the NSs [6, 22, 23-24, 39-42] have drawn a great attention during the last two decades. Different models of Multi-Attribute Decision Making (MADM) for crisp set,

Neutrosophic Tri-Topological Space

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Keywords: Tri-open set, Tri-closed set, Tri-semi-open set, Tri-pre-open set, Neutrosophic crisp tri-topology, Neutrosophic tri-topology

Abstract

In this article, we present the notion of neutrosophic tri-topological space as a generalization of neutrosophic bi-topological space. Besides, we study the different types of open sets and closed sets namely neutrosophic tri-open sets, neutrosophic tri-closed sets, neutrosophic tri-semi-open sets, neutrosophic tri-pre-closed sets, etc. via neutrosophic tri-topological spaces. Further, we investigate several properties, and prove some propositions, theorems on neutrosophic tri-topological spaces.

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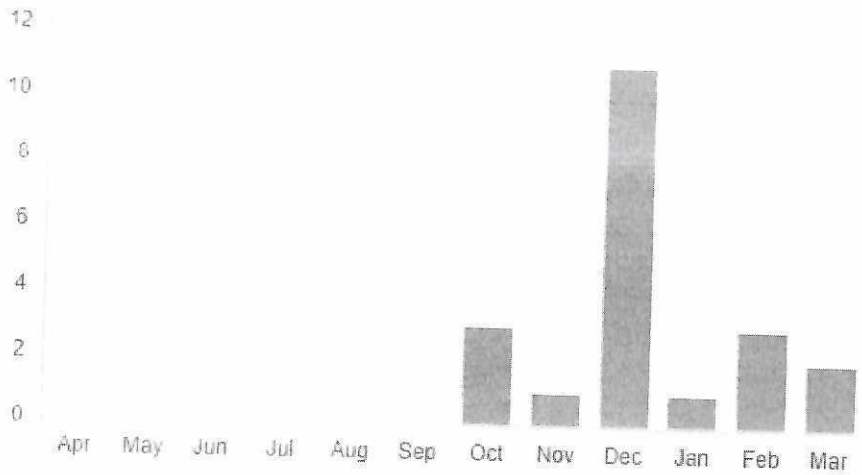

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NEW TAUBERIAN THEOREMS FOR CESÀRO SUMMABLE TRIPLE SEQUENCES OF FUZZY NUMBERS

CARLOS GRANADOS[1], AJOY KANTI DAS[2], AND SUMAN DAS[3]

ABSTRACT. The purpose of this paper is to establish new results on Tauberian theorem for Cesàro summability of triple sequences of fuzzy numbers. Besides, we extend and unify several results in the available literature. Furthermore, a huge number of special cases, theorems and their implications are proved. We show some illustrative examples in support of the results obtained in this paper.

1. INTRODUCTION

The notion of the fuzzy set was originally introduced by Zadeh [23]. Later, Matloka [11] established bounded and convergent sequences of fuzzy numbers and proved that every convergent sequence is bounded. Then, Nanda [12] studied the spaces of bounded and convergent sequences of fuzzy numbers and proved that every Cauchy sequence of fuzzy numbers is convergent. Subrahmanyam [14] presented the notion of Cesàro summability of sequences of fuzzy numbers and established Tauberian hypotheses identified with the Cesàro summability method. Talo and Çanak [15] introduced the necessary and sufficient Tauberian conditions, under which convergence follows from Cesàro convergence of sequences of fuzzy numbers. Altın et al. [1] studied the concept of statistical summability by $(C,1)$-mean for sequences of fuzzy numbers and obtained a Tauberian theorem on that basis. Talo and Başar [16] introduced the concept of slow decreasing sequence for fuzzy numbers and have proved that Cesàro summable sequence (X_n) is convergent, if (X_n) is slowly decreasing. Çanak [3] established the concept of the slow oscillation (that is, both slowly decreasing and

Key words and phrases. Triple Cesàro summability, slow oscillation, Tauberian condition, sequence of fuzzy numbers.

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NEUTROSOPHIC *d*-IDEAL OF NEUTROSOPHIC *d*-ALGEBRA

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Abstract: In this article, we introduce the concept of neutrosophic *d*-ideal of neutrosophic *d*-algebra. Also we have studied several properties of them. We also furnish some suitable examples.

Keywords: *Fuzzy Set; Intuitionistic Fuzzy Set; Neutrosophic Set; d-Algebra; d-Ideal; d-Sub-Algebra.*

1. Introduction:

The concept of *BCK* algebra and *BCI* algebra are introduced by Imai & Iseki [18]. Thereafter, Negger & Kim [23] introduced the *d*-algebra as a generalization of *BCK* algebra. Negger et al. [22] discussed the ideal theory in *d*-algebra. In the year 1965, Zadeh introduced the idea of fuzzy set [26]. Thereafter, Atanassov introduced the notion of intuitionistic fuzzy set [1], which is the natural generalization of fuzzy set. Later on, Jun et al. [20] applied the notion of intuitionistic fuzzy set on *d*-algebra. Afterwards, the notion of intuitionistic fuzzy *d*-ideal of *d*-algebra was introduced by Hasan [16] in 2017. Thereafter, the concept of intuitionistic fuzzy *d*-filter was introduced by Hasan [17] in 2020. The concept of neutrosophic set was introduced by Smarandache [24]. In this article, we procure the notion of neutrosophic *d*-algebra and neutrosophic *d*-ideal by extending the notion of intuitionistic fuzzy *d*-ideal of *d*-algebra.

Research gap: No investigation on neutrosophic *d*-algebra and neutrosophic *d*-ideal has been reported in the recent literature.

Motivation: To fill the research gap, we introduce the neutrosophic *d*-algebra and neutrosophic *d*-ideal.

The rest of the paper is designed as follows:
In section-2, we recall *d*-algebra, *d*-ideal, fuzzy *d*-algebra, fuzzy *d*-ideal, intuitionistic fuzzy *d*-algebra, intuitionistic fuzzy *d*-ideal. In section-3, we introduce the notion of neutrosophic *d*-algebra, neutrosophic *d*-ideal, and the proofs of some propositions, theorems on neutrosophic *d*-algebra, and neutrosophic *d*-ideal. In section-4, we give the conclusions of work done in this paper.

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Topology on Ultra Neutrosophic Set

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Abstract:

In this paper, we introduce the ultra neutrosophic set, and define some operations and establish a few properties of the ultra neutrosophic sets. Using the notion of topology on ultra neutrosophic sets, we introduce the concept of ultra neutrosophic topology. Further, we define the notion of ultra neutrosophic interior and ultra neutrosophic closure via ultra neutrosophic topological space.

Keywords: *Neutrosophic Set; Ultra Neutrosophic Crisp Set; Ultra Neutrosophic Set.*

1. Introduction:

The fundamental concept of Neutrosophic Set (NS) was introduced by Smarandache [1], which is the generalization of the Fuzzy Set (FS) [2] and the Intuitionistic Fuzzy Set (IFS) [3]. The concept of Neutrosophic Crisp Set (NCS) was grounded by Alblowi et al. [4] in 2014. Afterwards, Neutrosophic Crisp Topological Space (NCTS) was studied by Salama et al. [5]. In 2015, Salama et al. [6] further studied NCS theory. Later on, the Ultra Neutrosophic Crisp Set (UNCS) was presented by El Ghawably and Salama [7] in 2015.

Research Gap: The Ultra Neutrosophic Set (UNS) and the Ultra Neutrosophic Topology (UNT) on UNSs have not yet been introduced in the literature.

Motivation: To address the research gap, we introduce the Ultra Neutrosophic Set (UNS) and present a few basic properties of UNSs. Also, we present the Ultra Neutrosophic Topology (UNT) on UNSs.

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An eco-friendly strategy for dairy wastewater remediation with high lipid microalgae-bacterial biomass production

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ARTICLE INFO

Keywords:
Microalgae bacterial consortium
Dairy wastewater
Phycoremediation
Lipid enhancement
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Metagenomic analysis

ABSTRACT

The present study attempts to integrate phycoremediation and enhanced lipid productivity using microalgae-bacterial consortium enriched from wastewater fed aquaculture pond. Metagenomic analyses and microscopic images of the consortium revealed the presence of *Chlorella variabilis*, *Parachlorella kessleri*, *Thermosynechococcus elongatus*, *Chlamydomonas*, *Phaeodactylum tricornutum*, Oscillatoriales, *Synechocystis* sp., *Microcystis aeruginosa*, Nostocales, *Navicula*, *Nannochloropsis*, other members of Chlorophyceae, Trebouxiophyceae, and Chroococcales along with potential bacterial bioremediants. During a 30 days trial run (15 days stabilization and 14 days remediation studies) for phyco-remediation drastic reduction in the nutrient and COD content from the treated wastewater samples was seen. There was up to 93% and 87.2% reduction in chemical oxygen demand (COD) and ammonium concentration, respectively. Further, almost 100% removal of nitrates and phosphates from the dairy wash water upon 48 h of treatment with polyculture under ambient temperature (25 ± 2 °C) with 6300 lux illumination and mild aeration, was observed for all the seven cycles. Interestingly, the nutrient and COD concentrations in the treated water were below the discharge standards as per Central Pollution Control Board (CPCB) norms. In additions, biomass (reported as dry cell weight) was enhanced by 67% upon treatment with ammonia rich dairy wastewater exhibiting 42% lipid, 55% carbohydrate, and 15.6% protein content enhancement. The polyculture mainly grows as attached biofilm to the surface, offered an easy harvesting and separation of grown biomass from the treated wastewater. Overall, dairy wastewater was found to be a potential nutrient source for microalgae-bacteria cultivation thereby making the treatment process sustainable and eco-friendly.

1. Introduction

Indiscriminate use of water in industrial and agricultural sectors has affected the water quality, rapidly leading to fresh water scarcity. In order to achieve the target of industrial development, the environmental management aspect was largely ignored earlier. The wastewaters contain excess organic and inorganic nutrients, including heavy metals and other toxic pollutants resulting from domestic, agricultural, and industrial activities that have found their way into the aquatic ecosystem (Mouchet, 1986; Lim et al., 2010; Kumar and Singh, 2017). The dairy industry is one of the primary pollution sources due to the copious volume of wastewater generation and its high nutrient content. In India, dairy industries produce 58.6 m^3 of milk annually, utilizing 8.7 m^3 of water per m^3 of milk produced, resulting in 6 m^3 of wastewater per m^3 of processed milk (Brar et al., 2019). Though there are several strategies to treat nutrient rich wastewater (Kushwaha et al., 2010; Slavov, 2017), conventional treatment methods require a relatively large amount of space owing to their multiple treatment steps (7–8 steps), extended time (105–120 h), energy consumption (70 kW for 500 m^3 wastewater per day) (Biswas et al., 2019) with bulky sludge production. Although the sludge generation represents 1–2% of the wastewater volume, sludge management accounts for 20–60% of total wastewater treatment operating costs (Perumal et al., 2017). The work of Halder et al. (2020) has resulted in the conversion of the total volume of dairy wastewater into ammonia rich liquid biofertilizer through a microbial approach, within 16 h, without sludge generation. However, it is unsuitable for urban dairies as they would not utilize the maximum volume of generated liquid biofertilizer due to the limitation of surrounding farmlands. The disposal of excess liquid biofertilizer would damage the aquatic environment severely.

With the advances in biotechnology, phycoremediation has become an effective approach to decontaminate the environment and ensure resource restoration (Hammouda et al., 1995; Hoffmann, 1998; Olguín, 2003; Marchello et al., 2015). A paradigm shift in the last few years has led to the consideration of wastewater as a precious resource rather than mere waste. The wastewater contains energy rich organics, nutrients such as nitrogen (N) and phosphorus (P), and other micro- and macronutrients required for microalgal growth. Algal proliferation in wastewater fed ponds contributes to dissolved oxygen production with nutrient assimilation and treatment. Besides the wastewater characteristics, microalgal productivities are strongly influenced by microalgal strains used for the cultivation. Typical algal species that grow in

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4. A novel strategy for microbial conversion of dairy wastewater into biofertilizer

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A novel strategy for microbial conversion of dairy wastewater into biofertilizer

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ABSTRACT

Dairy industry generates copious amount of wastewater from its milk processing unit (1–10 m^3 of wastewater per m^3 of processed milk) which needs to be treated before getting discharged. The conventional treatment processes are tedious, energy intensive, and an additional burden for the dairy industry. This study attempts to develop an alternative strategy to convert the dairy wastewater into liquid biofertilizer. A tailor-made microbial consortium based biofilm reactor with 8.64 $m^3\ d^{-1}$ processing capacity, within 16 h of hydraulic retention time (HRT) at ambient temperature produced biofertilizer containing 96.01 mg L^{-1} ammonia from dairy wastewater at a flow rate of 360 L h^{-1} with associated 73.72% nitrate, 72.46% phosphate, 61.30% Biological Oxygen Demand (BOD) and 57.23% Chemical Oxygen Demand (COD) reduction. A similar system of 10.94 $m^3\ d^{-1}$ processing capacity at 456 L h^{-1} flow rate produced 296.79 mg L^{-1} ammonia with nitrate, phosphate, BOD and COD reduction of 42.71%, 84.00%, 89.55% and 76.68% respectively. This liquid biofertilizer could enhance grain yield in maize (*Zea mays* var. Vijay) by 1.19-fold. It increased biomass yield in Sorghum Sudan grass (*Sorghum sudanense*) by 3.5-folds and Lemongrass (*Cymbopogon citratus* var. Dhanitri and var. Krishna) by 2.1 and 2.64 folds respectively. It enhanced gel content in Aloe vera (*Aloe elongata* var. Ghikuari) by 1.63-folds when compared to chemical fertilizer treatment. This single-step dairy wastewater treatment system requires ten times less energy with the development of a value-added product (biofertilizer). It could make the dairy wastewater management a revenue earning (USD 10.28 d^{-1} for 600 $m^3\ d^{-1}$ processing capacity reactor), eco-friendly, zero discharge process preventing the use of freshwater and chemical fertilizer in agriculture, and saving 89.98% carbon dioxide equivalent (CO_2 eq.) gas emission leading to environmental protection.

1. Introduction

India, with the largest livestock population of the world, is among the significant producers of milk (FAO, 2020) and dairy products and is known for "Operation Flood"/"White Revolution" initiated in 1970. Dairy industry generates 1–10 m^3 of wastewater per m^3 of processed milk (Britz et al., 2006) and the volume of milk processing is expected to increase (Bogusiewicz-Zablocka et al., 2019) to satisfy the growing demand for dairy products (Egas et al., 2019). It uses large volumes of freshwater for downstream processing. The dairy wastewater comes from equipment washing (with detergents, alkali, and nitric acid), spilled milk and its products as well as the runoff from yard area contaminated with urine

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REVIEW

Development, dynamics and control of antimicrobial-resistant bacterial biofilms: a review

Brij Pal Singh[1] · Sougata Ghosh[1,2] · Ashwini Chauhan[3]

Received: 7 December 2020 / Accepted: 18 December 2020

Abstract
Antimicrobial resistance is a major health issue inducing the inefficiency of antimicrobial drugs. Indeed, pathogenic microorganisms become resistant when frequently exposed to antimicrobial drugs. In particular, when bacteria are attached to a surface and expand as a biofilm, they become more resistant to antimicrobials because single or multiple bacterial species are embedded in a slimy extracellular polymeric substance that acts like a shield. Biofilms often contaminate medical devices and food industrial equipment, thus leading to infections and food spoilage. Here, we review the basics of biofilm development from a planktonic bacterium; signaling in biofilm and relationship with antimicrobial resistance; biofilm control and destruction strategies using quorum sensing inhibitors, ultrasound, acidic electrolyzed water, and enzymatic and combination killing; and emerging approaches, such as bacteriophage-mediated disruption and antimicrobial peptides to control bacterial biofilms.

Keywords Biofilms · Antimicrobial resistance · Quorum sensing · Nanomedicine · Bacteriophage · Phytocompounds

Abbreviations

OECD	Organization for Economic Co-operation and Development
MSCRAMMs	Microbial surface components recognizing adhesive matrix molecules
SAAT	Self associating autotransporter proteins
AIDA-I	Adhesin involved in difluse adherence-I
PNAG	Poly-(β-1,6)-*N*-acetylglucosamine
CFBE41o	Cystic fibrosis bronchial epithelial cell line
MRSA	Methicillin-resistant *Staphylococcus aureus*

Introduction

Infectious diseases continue to be the leading cause of morbidity and mortality worldwide and are constantly growing due to the resistance of pathogens to antibiotics. The evolution of antimicrobial-resistant strains is a natural phenomenon that happens when microorganisms are exposed to antimicrobial drugs, and resistant traits can be exchanged between certain types of bacteria (Sharma et al. 2018). The overuse of antibiotics is recognized as a primary driver contributing to increased prevalence of antimicrobial resistance (Khan et al. 2019; Gu et al. 2020). Besides human health and lives, there is also an economically high cost of antibiotic resistance (Rodgers et al. 2019). Already, 700,000 patients die from antimicrobial resistance worldwide each year (Ghosh et al. 2018). The latest Organization for Economic Co-operation and Development (OECD) report estimates that 2.4 million people will die from the infection of antimicrobial-resistant microorganisms in Europe, North America and Australia over the next 30 years and could cost up to US$ 3.5 billion annually (http://www.oecd.org/health/stemming-the-superbug-tide-9789264307599-en.htm). This condition is already drastic in many low and middle income countries, which are expected to rise significantly (Hofer 2019).

In a natural environment, bacteria exist predominantly in multicellular communities called biofilms that are attached

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Short communication

Lupeol and amphotericin B mediate synergistic anti-leishmanial immunomodulatory effects in *Leishmania donovani*-infected BALB/c mice

Antu Das[a,1], Junaid Jibran Jawed[b,1], Manash C. Das[a], Shabina Parveen[b], Chinmoy Ghosh[a,c], Subrata Majumdar[b], Bhaskar Saha[d], Surajit Bhattacharjee[a,*]

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ABSTRACT

Leishmania donovani, a protozoan parasite, inflicts the disease Visceral leishmaniasis (VL) Worldwide. The only orally bioavailable drug miltefosine is toxic, whereas liposomal amphotericin B (AmpB) is expensive. Lupeol, a triterpenoid from *Sterculia villosa* bark, was exhibited immunomodulatory and anti-leishmanial activity in experimental VL. Herein, we evaluated synergism between sub-optimum dose of AmpB and lupeol in anti-leishmanial and immunomodulatory effects in *L. donovani*-infected BALB/c mice. We observed that a combination of sub-optimum dose of lupeol and AmpB significantly reduced the hepatic and splenic parasitic burden accompanied by enhanced nitric oxide production, robust induction of Th1 cytokines (IL-12 and IFN-γ) but suppressed Th2 cytokine (IL-10 and TGF- β) production. The treatment with the lupeol-AmpB combination enhanced p38mitogen-activated protein kinase (p38MAPK), but reduced extracellular signal-related kinase (ERK-1/2), phosphorylation and up-regulated pro-inflammatory response. The present work thus indicates a lupeol-AmpB-mediated immunotherapeutic approach for eliminating the parasite-induced immunosuppression.

1. Introduction

Visceral leishmaniasis (VL), a major infectious disease in tropical and subtropical countries- is treated with sodium antimony gluconate (SAG), amphotericin B (AmpB), pentamidine, and miltefosine [1]. However, the consistent therapeutic failures and emergence of tolerance of SAG compel the use of more lethal second-line drugs and new formulation, for example, delivery of liposomal ampB and nitrosylated chalcone [2]. Clinical trials were reported to carry out with n-methyl-glucamine antimoniate (glucantime) and pentamidine isethionate for refractory VL [3]. Therefore, a new therapeutic strategy that would be effective against the disease and devoid of side effects is a pressing need.

As the parasite induces selective immunosuppression in a host, immunotherapy may, in principle, improve VL chemotherapy. Although interferon-gamma (IFN-γ), interleukin 12 (IL-12), glucan, tucaresol and, a member of the tumor necrosis factor receptors named as OX40L-Fc [4] were tested for immunotherapy of experimental VL, they fell short of the desired efficacy. The development of tolerance to *Leishmania*-targeted bioactive compounds by *L. donovani* becomes a pressing issue [5]. Combination of sub-optimal dose of existing drugs like AmpB with newly developed compounds may provide an alternative approach for reducing tolerance [6–7]. Therefore, we chose to explore the several ethno-medicinal plants as sources for novel anti-leishmanial agents [8] such as Lupeol, a tri-terpenoid from *Sterculia villosa*. As we had previously reported anti-leishmanial and immunomodulatory effects of lupeol [8], the current study was designed to characterize the synergism between the sub-optimal doses of lupeol and AmpB in anti-leishmanial activities and immunomodulation.

It is reported that *Leishmania* resides within host macrophages by

Abbreviations: AmpB, amphotericin B; cDNA, complementary DNA; EDTA, ethylene-diamine-tetra-acetic acid; ERK 1/2, extracellular signal-related kinase-1/2; FBS, fetal bovine serum; GAPDH, glyceraldehyde-3-phosphate dehydrogenase; iNOS, inducible nitric oxide synthase; LDU, Leishman-Donovan units; MAPKs, mitogen-activated protein kinases; NO, nitric oxide; PBS, phosphate-buffered saline; PCR, polymerase chain reaction; SAG, sodium antimony gluconate; SLA, soluble *Leishmania* antigen; SOA, sub-optimum dose of AmpB; SOL, sub-optimum dose of lupeol; Th, T-helper; TGF, transforming growth factor; VL, Visceral leishmaniasis

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Study of polydiacetylenes and rhodamine-800 mixed film at air–water interface and onto solid support: Trace of fluorescence resonance energy transfer (FRET)

Sudip Suklabaidya, Sekhar Chakraborty, Jaba Saha, Bapi Dey, Surajit Sarkar, Debajyoti Bhattacharjee & Syed Arshad Hussain

Polymer Bulletin **78**, 93–113 (2021)

Abstract

Here, we report the mixing behaviour of diacetylene monomer 10, 12-tricosadiynoic acid (TCDA) and rhodamine-800 (Rh8) using Langmuir–Blodgett (LB) technique. The presence of Rh8 affected the structures, phase behaviour as well as colorimetric properties of TCDA in the mixed films at air–water interface and onto solid support. The mixed LB films having TCDA molefraction ≥ 0.5 leads to multilayer formation, whereas multilayer formation was hardly observed for the films containing TCDA molefraction less than 0.5. It was observed that polymerization as well as phase change (blue to red) was possible only for multilayered films.

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Issue 17, 2021

Previous Next

From the journal:
RSC Advances

7-Alkoxy-appended coumarin derivatives: synthesis, photo-physical properties, aggregation behaviours and current–voltage (*I–V*) characteristic studies on thin films†

Abhijit Rudra Paul,[a] Bapi Dey,[b] Sudip Suklabaidya,[b] Syed Arshad Hussain[b] and Swapan Majumdar *[a]

Author affiliations

Abstract

In this study, we designed and synthesised a series of coumarin derivatives appended with a long alkoxy chain on the seventh position of the coumarin-3-carboxylate/carboxylic acid core to make thin film materials. Synthesised compounds were characterized by their UV and fluorescence spectra in solutions as well as their films prepared by both LB and spin-coated methods. The surface morphology and electrical behaviour of thin films were judged by AFM, SEM and *I–V* characteristic mapping respectively. Isotherm, UV-Vis absorption and fluorescence spectroscopic investigations revealed the

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Two Approaches for Modeling ELF Wave Propagation in the Earth-Ionosphere Cavity With Day-Night Asymmetry

Publisher: IEEE

Ernő Prácser ; Tamás Bozóki ; Gabriella Sátori ; János Takátsy ; Earle Willia... All Authors

Abstract: In this article, we introduce a lesser-known analytical treatment and a new numerical approach to model electromagnetic wave propagation in the lowest part of the extreme... **View more**

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Abstract:

In this article, we introduce a lesser-known analytical treatment and a new numerical approach to model electromagnetic wave propagation in the lowest part of the extremely low-frequency (ELF) band (<; 100 Hz) that takes into consideration the day-night asymmetry of the Earth-ionosphere cavity We present numerical tests showing that the two models produce practically the same output, i.e., the relative difference between them is less than 0.4%. Our result is an important step toward inferring the distribution and intensity of global lightning activity based on the Schumann resonance (SR) measurements, which is the main objective of our work.

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Page(s): 4599 - 4609 **INSPEC Accession Number:**

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RESEARCH ARTICLE

Study of spectral characteristics of black carbon from biomass burning and source apportionment over Agartala in the northeastern India

Parminder Kaur[1] · Prasanth Srinivasan[1] · Pranab Dhar[1] · Barin Kumar De[1] · Anirban Guha[1]

Received: 26 June 2019 / Accepted: 12 February 2020 / Published online: 3 March 2020

Abstract

We have studied the black carbon (BC) mass concentrations, contributions from Fossil Fuels (FF), and Biomass burning (BB) to total BC mass concentrations using a 7-wavelength Aethalometer (Model, AE-31; Make, Magee Scientific, USA) at a rural continental location in the northeastern India. We have taken the continuous measurements of BC from January 2011 to December 2017 (excluding the year 2016 due to nonavailability of data). The annual mean BC concentration at 880 nm is observed maximum 12.56±5.06 μgm^{-3} in the year 2011 with a minimum of 7.26±2.76 μgm^{-3} during the year 2015." is the final sentence. BC, BC_{ff}, and BC_{bb} mass concentrations show significant variation during morning, afternoon, evening, and night hours. The significant monthly, seasonal, and annual variabilities in the BC concentration, equivalent BC from FF and BB, are due to seasonal change in the emission sources, boundary layer dynamics, and dispersion and dilution conditions. The determination of Angstrom exponent (α) for the BC emitted during burning of different biofuels by performing a burning experiment is an important part of the present study. We have conducted a survey in and around the study location to know the different biofuels used by the people for daily household activities, and those biofuels are used in the burning experiment. As a result of biomass burning experiment to determine Angstrom exponent, we have found the α values to be ranging from 1.20 to 2.37 for flaming and a range from 1.59 to 2.33 for smoldering conditions for different biofuels. Annual mean contributions of BC_{ff} and BC_{bb} to the total BC are found to be dominated by FF emissions during the whole study period. The percentage contribution of BC_{ff} and BC_{bb} is found to be 56% and 44% during winter season due to increase in wood and biomass burning activities for various purposes. We have found the higher percentage contribution from BC_{ff} (85%) during monsoon season due to reduction in usage of biofuels.

Keywords Black carbon · Apportionment · Fossil fuel · Biomass burning · Biofuels · Spectral properties

Introduction

Atmospheric black carbon (BC) aerosol is an important constituent of particulate matter. BC particles impact the Earth's climate and air quality. BC is a graphitic form of carbon particles with unique physical properties. The main sources of BC particles in the atmosphere are combustion processes, especially incomplete combustion involving fossil fuel (coal, diesel, petrol, etc.), biofuels (wood, cow dung, etc.), and biomass burning (forest fires, shrubs, dry leaves, crop residue, etc.) (Bond et al. 2013). During BB, several other organic materials are emitted, which condense over BC particles and change their optical properties. BC also strongly absorb the incoming solar radiation and outgoing radiation, which have significant effect on aerosol radiative forcing. So BC is getting much attention as climate-warming agent of comparable strength as anthropogenic CO_2 (IPCC 2013). In India, mainly in the Indo-Gangetic plains (IGP), large amount of BC is increasing day by day due to rapid increase in industrialization, daily energy needs, traffic emissions, thermal power

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Original Paper | Published: 16 January 2021

Martian Lee-wave cloud near Ascraeus Mons during Martian years 33 and 34: a study based on the Mars color camera (MCC) images

J. Kalita, M. K. Mishra & A. Guha

Indian Journal of Physics **96**, 25–41 (2022)

Abstract

The north-eastern slope of Ascraeus Mons in Mars shows evidence of gravity wave cloud formation, commonly known as Lee-wave cloud. Mars color camera, onboard India's first Mars orbiter mission, has captured over 25 images of Lee-wave clouds during Martian years 33 and 34. In our present study, our main objective is to estimate the atmospheric parameter associated with wave cloud appears over the Lee side of Ascraeus Mons and to interpret our results physically for the observed events. We have analyzed all the images of Lee-wave clouds and estimated the physical parameter such as wavelength, wind speed, height, formation temperature, nature of the cloud particle, and other atmospheric parameters related to the events. The wavelength of the Lee-wave cloud varies from 25 to

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Article Publisher preview available

Lightning Enhancement in Moist Convection With Smoke-Laden Air Advected From Australian Wildfires

Geophysical Research Letters

June 2021 · Geophysical Research Letters 48(11)
DOI:10.1029/2020GL092355

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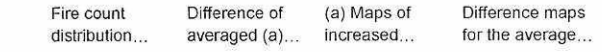
Abstract and Figures

Plain Language Summary The notorious 2019–2020 Australian wildfire devastated >46 million acres of land and heavily contaminated the atmosphere over the Australian continent and offshore regions. In conditions of moist convection over the polluted ocean, massive heat from wildfires on land is ineffectual and aerosol effects can be disentangled from the thermodynamic factors in lightning response. This study focuses on this natural experiment and addresses the lightning changes during the wildfire season by checking both thermodynamic parameters and cloud microphysics. Results of the average surface temperature, convective available potential energy, Bowen ratio, and latent and sensible heat flux support a weaker thermodynamic condition for relatively infrequent lightning activity, crediting aerosol effects for the observed lightning enhancement of 270% over the polluted ocean. Added aerosol mainly invigorates the positive intra-cloud (IC) strokes and negative cloud-to-ground (CG) strokes in oceanic convection. A noticeable positive correlation between precipitation and lightning is identified. Rainfall events accompanied by lightning activity increase by 240% with added aerosol. Clear evidence is shown for an augmentation of smaller cloud ice particles, while changes of the cloud liquid water path are feeble over the polluted ocean. Added aerosol energizes the convective strength systematically and more frequent and robust mixed-phase development invigorates lightning discharges.



Fire count distribution... | Difference of averaged (a)... | (a) Maps of increased... | Difference maps for the average...

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Journal of Geophysical Research: Atmospheres / Volume 126, Issue 3 / e2020JD033526
Research Article Full Access

Evolution of Global Lightning in the Transition From Cold to Warm Phase Preceding Two Super El Niño Events

E. Williams, T. Bozóki ✉, G. Sátori, C. Price, P. Steinbach, A. Guha, Y. Liu, C. D. Beggan, M. Neska, R. Boldi, M. Atkinson

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https://doi.org/10.1029/2020JD033526
Citations: 3

Abstract

Multistation observations of Schumann resonance (SR) intensity document common behavior in the evolution of continental-scale lightning activity in two super El Niño events, occurring in 1997/98 and 2015/16. The vertical electric field component of SR at Nagycenk, Hungary and the two horizontal magnetic field components in Rhode Island, USA in 1997, and in 2014–2015, the two horizontal magnetic field components at Hornsund, Svalbard and Eskdalemuir, United Kingdom as well as in Boulder Creek, California and Alberta, Canada exhibit considerable increases in SR intensity from some tens of percent up to a few hundred percents in the transition months preceding the two super El Niño events. The UT time distribution of anomalies in SR intensity indicates that in 1997 the lightning activity increases mainly in Southeast Asia, the Maritime Continent and India, i.e. the Asian chimney region. On the other hand, a global response in lightning is indicated by the anomalies in SR intensity in 2014 and 2015. SR-based results are strengthened by comparison to independent lightning observations from the Optical Transient Detector and the World Wide Lightning Location Network, which also exhibit increased lightning activity in the transition months. The increased lightning is attributable to increased instability due to thermodynamic disequilibrium between the surface and the midtroposphere during the transition. The main conclusion is that variations in SR intensity may act as a precursor for the occurrence and magnitude of these extreme climate events, and in keeping with earlier findings, as a precursor to maxima in global surface air temperature.

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Response of ambient BC concentration across the Indian region to the nation-wide lockdown: Results from the ARFINET measurements of ISRO-GBP

Response of ambient BC concentration across the Indian region to the nation-wide lockdown: Results from the ARFINET measurements of ISRO-GBP

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Abstract:

In this study, we assess the response of ambient aero-sol black carbon (BC) mass concentrations and spectral absorption properties across Indian mainland during the nation-wide lockdown (LD) in connection with the Coronavirus Disease 19 (COVID-19) pandemic. The LD had brought near to total cut-off of emissions from industrial, traffic (road, railways, marine and air) and energy sectors, though the domestic emissions remained fairly unaltered. This provided a unique opportunity to delineate the impact of fossil fuel combustion sources on atmospheric BC characteristics. In this context, the primary data of BC measured at the national network of aerosol observatories (ARFINET) under ISRO-GBP are examined to assess the response to the seizure of emissions over distinct geographic parts of the country. Results indicate that average BC concentrations over the Indian mainland are curbed down significantly (10-40 percent) from pre-lockdown observations during the first and most intense phase of lockdown. This decline is significant with respect to the long-term (2015-2019) averaged (climatological mean) values. The drop in BC is most pronounced over the Indo-Gangetic Plain (greater than 60 percent) and north-eastern India (greater than 30 percent) during the second phase of lockdown, while significant reduction is seen during LD1 (16-60 percent) over central and peninsular Indian as well as Himalayan and sub-Himalayan regions. Despite such a large reduction, the absolute magnitude of BC remained higher over the IGP and north-eastern sites compared to other parts of India. Notably, the spectral absorption index of aerosols changed very little over most of the locations, indicating the still persisting contribution of fossil-fuel emissions over most of the locations.

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Materials Chemistry and Physics
Volume 258, 15 January 2021, 123946

Beryllium (Be) composition dependent structural and optoelectronic characteristics of wurtzite $Be_xMg_{1-x}S$ ternary alloys: First principle calculations with FP-LAPW scheme

Bimal Debnath [a], Debankita Ghosh [a], Manish Debbarma [a], Sayantika Chanda [a], Subhendu Das [a, b], Rahul Bhattacharjee [a, c], Surya Chattopadhyaya [a]

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Highlights

- Marginally nonlinear variation of a_0, c_0 B_0 & band-gap with Be-composition (x).
- Simulated stable wurtzite ternary alloys are direct-band-gap (Γ-Γ) semiconductors.
- Electron dominates in career transport due to lower effective mass compared to hole.
- Each hexagonal crystals show optical anisotropy and uniaxial birefringence.
- Static optical constants oppose and critical points follow trend of band-gap change.

Abstract

For the first time, beryllium (Be) composition dependent structural and optoelectronic characteristics of wurtzite $Be_xMg_{1-x}S$ ternary alloys have been investigated through first principle calculations. The WC-GGA scheme for structural and both EV-GGA and mBJ-GGA schemes for optoelectronic properties have been utilized for computing exchange-correlation potentials. The lattice constants (a_0,c_0) decrease, while bulk modulus (B_0) increases nonlinearly with increasing Be-composition x. Though MgS is a direct (Γ-Γ) and BeS is an indirect (M-Γ) band gap semiconductor, their amalgamation possesses direct band gap (Γ-Γ) ternary semiconductor alloys. Calculated minimum band gap (E_g) with mBJ-GGA potentials is higher then that with EV-GGA for each specimen and it nonlinearly reduces with increasing Be-composition x. Calculated higher effective mass of hole compared to electron is indicating the domination of electrons over holes in carrier transport phenomenon in each specimen. The electronic transport properties of the considered specimens have been computed in terms of their Seebeck coefficients, electrical conductivities, electronic thermal conductivities, electronic power factors, electronic specific heats and Pauli magnetic susceptibilities. Each specimen shows optical anisotropy and hence uniaxial birefringence. The peak(s) in the ultraviolet region of the dielectric function spectra of the considered specimens are contributed by S-3p→Be-3s, 2p & Mg-4s, 4p electronic excitations. Moreover, enhancement in

Article

Cationic and anionic composition-dependent mechanical and thermal properties of zinc-blende specimens under MgxZn1-xSySe1-y quaternary system: calculations with density functional FP-LAPW scheme

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DOI:10.1140/epjb/s10051-020-00024-4

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References (86)

Abstract

Elastic and thermal properties of zinc-blende MgxZn1-xSySe1-y quaternary alloys and their constituent binary/ternary compounds have been computed through first principles calculations. Elastic stiffness constants of specimens have been increased almost linearly with increasing sulfur composition at any fixed magnesium composition, while reverse trends have been observed with increasing magnesium composition at any fixed sulfur composition in each binary–ternary/ternary–quaternary system. Hardness of specimens has been increased almost linearly with increasing sulfur composition at any fixed magnesium composition, while it has been decreased with increasing magnesium composition at any fixed sulfur composition in each system. Mechanical stability, elastic anisotropy, compressibility, ductility and plasticity have been observed in each compound. Mixture of covalent and ionic bonding with prominent role of covalent nature, dominating role of bond bending over stretching and central nature of interatomic forces have been investigated in each compound. Interaction between the atoms in any compound has been observed to be anharmonic in nature via calculated Gruneisen parameter. Computed Debye temperature, Debye frequency, thermal conductivity and melting temperature of all the specimens have also been reported.

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ORIGINAL PAPER

First-principles investigations of composition-dependent mechanical properties of zinc-blende constituents of $Mg_xZn_{1-x}S_yTe_{1-y}$ rectangular quaternary system

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Abstract: Mechanical properties of zinc-blende $Mg_xZn_{1-x}S_yTe_{1-y}$ alloys and cationic (Mg) and anionic (S) composition dependence of these properties have been investigated theoretically through First-principles calculations. The elastic stiffness constants increase nonlinearly with increasing sulfur concentration at each fixed magnesium concentration, while each of them reduces with increasing magnesium concentration at each fixed sulfur concentration in any binary–ternary/ternary–quaternary system. Hardness of specimens increases nonlinearly with increasing sulfur concentration at each fixed magnesium concentration, while it reduces with increasing magnesium concentration at each fixed sulfur concentration in any binary–ternary/ternary–quaternary system. Each of the considered specimens is mechanically stable, ductile, elastically anisotropic, fairly compressible and plastic in nature. Blending of covalent and ionic bonding with domination of covalent, bending over stretching in chemical bonds and central character of force between atoms have been observed in each specimen. Computed Debye temperature confirms MgS as the hardest and ZnTe as the softest among all the considered specimens. Computed Gruneisen parameter of each specimen demonstrates anharmonic character of atom–atom interactions in each crystal. Thermal conductivity and melting temperature of each of the considered specimens have also been computed in the present study.

Keywords: $Mg_xZn_{1-x}S_yTe_{1-y}$ alloys; Density functional study; PBE-GGA functional; Mechanical properties; Sulfur and magnesium composition dependence

1. Introduction

In materials science, various properties of a set of compounds can be manipulated with higher efficiency and higher degree of accuracy through formation of their quaternary alloys instead of their ternary alloys. It expands the range of their diverse target-oriented applications. Moreover, it is able to fulfill the specific requirements in designing any particular device in a more efficient way. Any rectangular quaternary system is surrounded by four ternary systems. Each of such ternary systems is originated again from an appropriate pair of binary compounds so that a set of four basic binary compounds of known properties is treated as primary ingredients of any rectangular quaternary alloy system. Therefore, appropriate selection of four basic diatomic constituents plays the key role behind the successful achievement of any desired target through formation of any quaternary alloy.

In this article, the elastic properties of zinc-blende (B3) specimens under $Mg_xZn_{1-x}S_yTe_{1-y}$ quaternary system have been reported. Such quaternary system is bounded by two anionic ternary systems MgS_yTe_{1-y} and ZnS_yTe_{1-y} as well as two cationic ternary systems $Mg_xZn_{1-x}S$ and $Mg_xZn_{1-x}Te$. Alloys under any of the aforesaid ternary systems have again been formed by selecting the appropriate pair from the set of four diatomic compounds MgS, MgTe, ZnS and ZnTe. Therefore, the present theoretical initiative would be able to provide a set of ternary and quaternary alloys with new elastic properties, which are completely different from their basic binary constituents. The computed mechanical properties for all the aforesaid members of $Mg_xZn_{1-x}S_yTe_{1-y}$ family would also be able to provide their direct/indirect linkage with several

Supplementary Information The online version of this article (https://doi.org/10.1007/s12648-021-02013-4) contains supplementary material, which is available to authorized users.

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Calculations of selenium and cadmium concentration dependent elastic and thermal properties of zinc-blende specimens under $Cd_xZn_{1-x}Se_yTe_{1-y}$ quaternary system with density functional theory

Sayantika Chanda [a], Manish Debbarma [a], Debankita Ghosh [a], Subhendu Das [a, b], Bimal Debnath [a], Rahul Bhattacharjee [a, c], Surya Chattopadhyaya [a]

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https://doi.org/10.1016/j.mtcomm.2021.102136

Highlights

- All Specimens show mechanical stability, elastic anisotropy, ductility & plasticity.
- Binary specimens show dynamic stability, but their alloys show dynamic instability.
- Mixture of covalent and ionic bonding with dominating covalent in each specimen.
- Specimens show central type of bonding force & dominantly bending in chemical bonds.
- Calculated hardness shows that ZnSe is stiffest and CdTe is softest in all compounds.

Abstract

First principle based investigations on mechanical and thermal properties have been executed for the zinc-blende specimens constituting the $Cd_xZn_{1-x}Se_yTe_{1-y}$ system. Elastic stiffness constants of specimens have been increased with increasing selenium concentration at any fixed cadmium concentration, while reverse tendencies have been observed with increasing cadmium concentration at any fixed selenium concentration. Hardness of specimens has been increased with increasing selenium concentration at any fixed cadmium concentration, while it has been decreased with increasing cadmium concentration at any fixed selenium concentration. The phonon dispersion spectra indicate dynamical stability in each binary, but instability in each ternary and quaternary alloy in their zinc-blende structures. Mechanical stability, elastic anisotropy, compressibility, ductility, plasticity, mixing of covalent and ionic bonding with prominent role of covalent over ionic, prominent role of bending over stretching in chemical bonds and central nature of interatomic forces have been observed in each compound. Calculated Debye temperature has established ZnSe as the hardest and CdTe as the softest among all the compounds. The anharmonic nature of interactions between the atoms in any compound has been confirmed with respective

Materials Science in Semiconductor Processing
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Structural and optoelectronic properties of cubic $Zn_{1-x-y}Be_xMg_ySe$ quaternary alloys nearly lattice matched to GaAs substrate: A density functional investigation

Debankita Ghosh [a], Manish Debbarma [a], Sayantika Chanda [a], Bimal Debnath [a], Subhendu Das [a, b], Rahul Bhattacharjee [a, c], Surya Chattopadhyaya [a] ✉

https://doi.org/10.1016/j.mssp.2021.105803

Highlights

- Lattice constant decreases, but bulk modulus increases with increasing compositions.
- Designed quaternary alloys on GaAs substrate are direct-band-gap semiconductors.
- Fundamental band gap increases with increasing compositions in quaternary alloys.
- Electrons play leading role in career transport phenomenon in quaternary alloys.
- Concentration dependence of zero-frequency limits & band gap are opposite in nature.

Abstract

Density functional calculations of structural and optoelectronic properties of cubic $Zn_{1-x-y}Be_xMg_ySe$ quaternary alloys are carried out considering their nearly lattice matching to GaAs substrate. Calculations ensure that each quaternary alloy is a direct band gap (Γ–Γ) semiconductor. The mBJ-GGA based computed minimum band gap of each alloy is larger that with EV-GGA scheme. Enhancement in beryllium or magnesium composition nonlinearly reduces the lattice constant, but enhances the bulk modulus and minimum band gap of quaternary alloys. Lower effective mass of electrons compared to holes confirms dominant role of electrons in carrier transportation in each specimen. Electronic transitions from occupied Se-4p state of valence band to unoccupied Zn-5s, Mg-3p, Mg-4s, Be-2p and Be-3s states of conduction band collectively contribute intense peaks in $\varepsilon_2(\omega)$ spectra of each quaternary alloy. Quaternary semiconductor with higher band gap possesses lower value of zero-frequency limits in $\varepsilon_1(\omega)$, $n(\omega)$ and $R(\omega)$ spectra, but requires higher critical point energies in $\varepsilon_2(\omega)$, $k(\omega)$, $\sigma(\omega)$ and $\alpha(\omega)$ spectra and vice versa. Computed oscillator strength of each quaternary alloy confirms the presence of sufficient number (>200) of electrons in the unoccupied states of conduction band above 27.0 eV of incident photon energy during any optical excitation.

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Mechanics of Materials
Volume 158, July 2021, 103840

Theoretical investigation of magnesium and selenium concentration dependent elastic properties of zinc blende specimens under the $Mg_xZn_{1-x}Se_yTe_{1-y}$ quaternary system with density functional FP-LAPW approach

Debankita Ghosh, Sayantika Chanda, Manish Debbarma, Bimal Debnath, Surya Chattopadhyaya

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https://doi.org/10.1016/j.mechmat.2021.103840

Highlights

- Computed elastic constants show the trend $C_{11}>C_{12}>C_{44}$ in each specimen.
- Specimens are mechanically stable, elastically anisotropic & ductile.
- Mixture of covalent and ionic bonding with dominant covalent nature in each specimen.
- Debye temperature, thermal conductivity & melting temperature are calculated.
- Gruneisen parameter shows anharmonic type atom-atom interactions in each specimen.

Abstract

First principle calculations are carried out to investigate elastic stiffness constants and allied mechanical properties of the zinc blende specimens under the $Mg_xZn_{1-x}Se_yTe_{1-y}$ quaternary system. Magnesium and selenium concentration dependence of these properties is also investigated. Computed elastic stiffness constants show the trend $C_{11} > C_{12} > C_{44}$ in each specimen. Elastic stiffness constants and hardness of specimens increase nonlinearly with increasing selenium composition at each fixed magnesium composition, while they decrease with increasing selenium-composition at each fixed magnesium-composition in any binary-ternary or ternary-quaternary system. Each specimen exhibits mechanical stability, elastic anisotropy, compressibility, ductility and plasticity. Mixed bonding with dominancy of covalent character over ionic, dominancy of bending over stretching in chemical bonds and central character of inter-atomic force are observed in each specimen. The anharmonic nature of interaction between the atoms in each specimen is confirmed from the calculated Grüneisen parameter. The calculated thermal conductivity and melting temperature of each specimen are also reported in the present article.

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Published: 16 April 2021

Composition dependence in mechanical properties of zinc-blende compounds associated with the $Cd_xZn_{1-x}S_yTe_{1-y}$ system: a density functional study

Sayantika Chanda, Manish Debbarma, Debankita Ghosh, Bimal Debnath & Surya Chattopadhyaya ✉

Bulletin of Materials Science **44**, Article number: 97 (2021)

Abstract

Mechanical characteristics of zinc-blende $Cd_xZn_{1-x}S_yTe_{1-y}$ alloys and their cationic (Cd) and anionic (S) composition dependence ($0.0 \leq x, y \leq 1.0$) have been computed with density functional theory. Elastic stiffness constants and hardness of specimens increase nonlinearly with enhancement in sulphur concentration at any cadmium concentration, whereas each of them has been decreased with increase in cadmium concentration at each fixed sulphur concentration. Each compound is mechanically and dynamically stable, elastically anisotropic, ductile, fairly compressible and plastic in nature. Again, leading role of covalent over ionic and bending over stretching in chemical

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Physica B: Condensed Matter
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First principle calculations of structural, elastic, electronic and optical properties of cubic $Cd_{1-x-y}Zn_xHg_yTe$ triangular quaternary alloys and their compounds

Sayantika Chanda, Manish Debbarma, Debankita Ghosh, Bimal Debnath, Surya Chattopadhyaya

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https://doi.org/10.1016/j.physb.2021.412999

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Abstract

Structural, elastic, electronic and optical properties of zinc blende $Cd_{1-x-y}Zn_xHg_yTe$ quaternary alloys and their allied compounds are calculated with DFT based FP-LAPW approach. Structural and mechanical properties are computed with PBE-GGA potentials, while mBJ-GGA and GGA + U potentials are employed to compute electronic and optical properties. All the thermodynamically stable specimens show mechanical stability, elastic anisotropy, ductility, mixed type of bonding etc. Each alloy shows direct (Γ-Γ) band gap (E_g) with $E_g^{mBJ-GGA} > E_g^{GGA+U}$. Electrons play dominant role over holes in carrier transportation. Exclusive or collective effort of the Te-5p→Zn-5s, Cd-6s, Hg-7s electronic transitions contribute peaks in the $\varepsilon_2(\omega)$ spectra of any specimen. Specimen with higher band gap possesses lower zero-frequency limits, but requires higher critical point energies in different optical spectra and vice versa. Calculated oscillator strength of quaternary alloys show presence of sufficient number of electrons in unoccupied conduction states beyond 27.0 eV during optical excitations.

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Keywords

$Cd_{1-x-y}Zn_xHg_yTe$ quaternary alloys; DFT & FP-LAPW; PBE-GGA; mBJ-GGA & GGA+U potential schemes; Structural and elastic properties; Electronic and optical properties

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ORIGINAL RESEARCH ARTICLE

First-Principles Investigation of Structural, Elastic, Electronic, and Optical Properties of $Cd_{1-x-y}Zn_xHg_yS$ Quaternary Alloys

Sayantika Chanda[1] · Manish Debbarma[1] · Debankita Ghosh[1] · Bimal Debnath[1] · Surya Chattopadhyaya[1]

Received: 14 November 2020 / Accepted: 27 April 2021 / Published online: 31 May 2021

Abstract

First-principles calculations have been carried out to explore the zinc and mercury composition-dependent structural, elastic, electronic, and optical properties of zinc-blend specimens under the $Cd_{1-x-y}Zn_xHg_yS$ triangular quaternary system. Each quaternary alloy shows thermodynamic stability. Computed elastic stiffness constants confirm the mechanical stability, ductility, elastic anisotropy, compressibility, plasticity, and mixed type of bonding in each specimen. Calculations with modified Becke–Johnson (mBJ)-generalized gradient approximation (GGA) and GGA+U schemes show that each ternary or quaternary alloy is a direct band gap (Γ–Γ) semiconductor. Carrier transportation in each specimen is significantly dominated by electrons due to their much lower effective mass compared to holes. Electronic transitions from the occupied S-3*p* state of the valence band to the unoccupied Zn-5*s*, Cd-6*s*, and Hg-7*s* states of the conduction band are exclusively or collectively responsible for the occurrence of intense peaks in the imaginary part of the dielectric function, $\varepsilon_2(\omega)$, spectra of the considered specimens. The calculated oscillator strengths of quaternary alloys show the presence of a sufficient number of electrons in the unoccupied states of the conduction band beyond 25.0 eV of incident energy during optical excitations.

Keywords $Cd_{1-x-y}Zn_xHg_yS$ quaternary alloys · density functional theory · PBE-GGA · mBJ-GGA and GGA+U potential schemes · structural and elastic properties · electronic and optical properties

Introduction

In materials science and engineering, any physical property of semiconductors can be manipulated by forming their different types of alloys. The ternary alloys of the type $A_xB_{1-x}C$ or AB_xC_{1-x}, formed by amalgamating two binary compounds, are treated as the introductory stage. Such a tuning process has some limitations because the properties are tuned by adjusting only the doping concentration, x. One can overcome such limitations by designing the quaternary alloys in two ways. The first way is the designing of triangular quaternary alloys of the type $A_xB_yC_{1-x-y}D$ by amalgamating three binary compounds. The second way is the designing of rectangular quaternary alloys of the type $A_xB_{1-x}C_yD_{1-y}$ by amalgamating four binary compounds. In such a triangular or rectangular quaternary alloy system, manipulation of any property of the compounds can be made by adjusting either of the doping concentrations x or y or both. This ensures the manipulation of any property with higher efficiency and a higher degree of accuracy compared to their ternary alloys[1–3]. Accordingly, they have provided ways to expand the range of diverse target-oriented applications. They will also be able to fulfill specific requirements of semiconductors for designing any particular device.

Any $A_xB_yC_{1-x-y}D$ triangular quaternary system is surrounded by three ternary systems, $A_xC_{1-x}D$, $B_yC_{1-y}D$, and A_xB_yD, which have been formed from three binary compounds AD, BD, and CD of known properties[1–3]. The $Cd_{1-x-y}Zn_xHg_yS$ triangular quaternary system may be considered as an example, where $Cd_{1-x}Zn_xS$, $Cd_{1-y}Hg_yS$, and Zn_xHg_yS act as three enclosing ternary systems. These three ternary systems are again originated from three binary compounds, CdS, ZnS, and HgS. In contrast, any $A_xB_{1-x}C_yD_{1-y}$ rectangular quaternary system is surrounded by four ternary systems, $A_xB_{1-x}C$, $A_xB_{1-x}D$, AC_yD_{1-y}, and BC_yD_{1-y}. Four binary compounds, AC, AD, BC, and BD, of known properties are the origin of such ternary systems[1–3]. The $Cd_xZn_{1-x}S_ySe_{1-y}$ rectangular quaternary system can be taken as an example. It is surrounded by four ternary systems,

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Journal of Alloys and Compounds
Volume 879, 25 October 2021, 160456

Experimental (XRD) and theoretical (DFT) analysis for understanding the influence of SHI irradiation on the stacking fault energy in CdSe nanocrystals

Debojyoti Nath, Ratan Das

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https://doi.org/10.1016/j.jallcom.2021.160456

Abstract

Swift heavy ion (SHI) irradiation can induce atomic scale structural reorientation. The amount of modification and reorientation due to irradiation depends on the specification of the respective heavy ions. Such a modification can directly affect the planar sequence and hence generate stacking faults in the material. Here, the effect of 120 MeV Ni^{10+} irradiation on the structural reorientation of CdSe as well as on the planar sequence has been studied through experimental (XRD) and theoretical (DFT) methods. The broadening of XRD peak along with the analysis of peak shift from the Bragg position has been used to determine the stacking fault energy (SFE). DFT based analysis has been performed to compare the stacking fault energy of pristine with the SHI irradiated sample. Finally, the effect of SHI irradiation on the density of states and electronic charge density has been studied, which indicates the presence of stacking faults in the CdSe nanocrystals after irradiation.

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Keywords

Swift heavy ion irradiation; X-ray diffraction analysis; Planar defects; Stacking fault energy (SFE); DFT analysis

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Ceramics International
Volume 47, Issue 12, 15 June 2021, Pages 16467-16482

Effect of cobalt doping on structural parameters, cation distribution and magnetic properties of nickel ferrite nanocrystals

Simi Debnath [a], Avisek Das [b], Ratan Das [a]

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https://doi.org/10.1016/j.ceramint.2021.02.095

Abstract

Here, thermal heat treatment method has been used for the synthesis of PVP capped nickel ferrite ($NiFe_2O_4$) and cobalt doped nickel ($Ni_{0.5}Co_{0.5}Fe_2O_4$) spinel ferrite nanocrystals with the aim of investigating the effect of Co doping on the structural and magnetic properties of $NiFe_2O_4$ nanocrystals. XRD analysis confirms the formation of a pure form of FCC nanocrystals of spinel ferrite type, where the average crystallite size has been found to be approximately 17 nm and 19 nm respectively for nickel ferrite (NF) and cobalt doped nickel ferrite (CNF) from XRD. Again, HRTEM study gives the average size for NF and CNF as 20 nm and 25 nm respectively. Further, SAED pattern indicates the polycrystallinity of both the sample, whereas EDX analysis confirms the presence of expected elements in the sample. From XRD data analysis different structural parameters such as lattice spacing, lattice constant, tetrahedral and octahedral ionic radii, oxygen position parameter, average cation radius per molecule, ionic packing coefficients (P_a, P_b), the degree of ionic packing (α), vacancy parameter (β), hopping lengths, and bond lengths etc. have been calculated for both nickel and cobalt doped nickel ferrite nanocrystals. Further, obtained cation distribution for NF and CNF nanocrystals from their XRD pattern analysis shows huge change in the distribution as a result of doping. In addition, FTIR spectral analysis also confirms the phase purity of both the samples. Magnetic characterization shows the improvement of different magnetic parameters due to cobalt doping on nickel, thereby making CNF nanocrystals suitable for different application purposes.

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Keywords

Spinel ferrite nanocrystals; X-ray diffraction; Structural analysis; Cation distribution; Magnetic properties

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Vacuum
Volume 190, August 2021, 110293

Surface and displacement damage engineering on CdSe nanocrystalline thin film by swift heavy Ag ions: A theoretical investigation by SRIM/TRIM package

Debojyoti Nath, Ratan Das

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https://doi.org/10.1016/j.vacuum.2021.110293

Highlights

- A SRIM/TRIM based theoretical analysis has been performed on SHI irradiated CdSe.
- Engineering of surface and structural properties have been studied.
- Surface modification induced by SHI has been studied in terms of sputtering yield.
- Displacement damage profile has been studied in terms of dpa.

Abstract

Engineering of surface and structural properties of a sample by ion beam technology has got tremendous attention in recent times. Here, surface modification in CdSe nanocrystalline thin film due to 120 MeV Ag swift heavy ions (SHI) irradiation has been studied through Stopping and Range of Ions in Matter (SRIM)/Transport of ions in matter (TRIM) package in terms of sputtering yield and average surface binding energy. From this study, average range has been obtained as 1.6 μm and average surface binding energy as 1.7 eV. SHI deposits huge energy to the atomic lattice and that displaces the lattice atoms from their original positions, which has been utilized here to obtain displacement damage. The damage profile has been studied as a function of dpa, which shows that the maximum displacement damage peaks is at 1.5 μm for CdSe due to 120 Mev Ag ions irradiation.

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Keywords

Nanoparticles; SRIM/TRIM; Sputtering yield; SHI irradiation; Displacement damage

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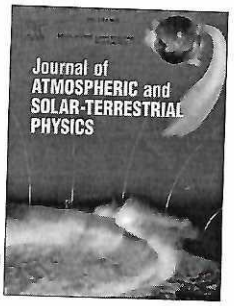

Ultra-low frequency (ULF) magnetic field emissions associated with some major earthquakes occurred in Indian Subcontinent

Swati, Birbal Singh, Devbrat Pundhir, Ashwini K. Sinha, K. Madhusudan Rao, Anirban Guha, Yashuhide Hobara

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Psychological Thought
psyct.swu.bg | 2193-7281
South-West University "Neofit Rilski"

Research Article

Factor Structure of the Updated Illinois Rape Myth Acceptance Scale in the Indian Context

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[b] Department of Psychology, Tripura University, Tripura, India.

Abstract

This study explores the factor structure and the other psychometric properties of the updated Illinois Rape Myth Acceptance Scale (IRMAS), in the Indian context. The sample was collected from 429 college and university students in the state of Tripura in India. All the items in the original scale were retained and five major factors were revealed by Principal Component Analysis. The model was deemed to be a good fit by the estimates of Confirmatory Factor Analysis. All the five factors derived were found to be reliable. The divergent validity of the study was verified; however, the convergent validity was ascribed from the high composite reliability of the factors. Different other measures like item-total, inter-item correlation strengthened the foundation of reliability and validity of the scale. The full scale was found to possess satisfactory reliability. The gender difference in the total test scores was assessed and found to be significant. The other details are discussed herein.

Keywords: Illinois Rape Myth Acceptance Scale; psychometry; factor structure.

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Psychological Thought
2021, Vol. 14(1), 56-73
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South-West University "Neofit Rilski"

> Pers Soc Psychol Bull. 2021 Jul 23;1461672211029786. doi: 10.1177/01461672211029786. Online ahead of print.

What Do We Hear in the Voice? An Open-Ended Judgment Study of Emotional Speech Prosody

Hillary Anger Elfenbein [1], Petri Laukka [2], Jean Althoff [3], Wanda Chui [4], Frederick K Iraki [5], Thomas Rockstuhl [6], Nutankumar S Thingujam [7]

Affiliations

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Abstract

The current study investigated what can be understood from another person's tone of voice. Participants from five English-speaking nations (Australia, India, Kenya, Singapore, and the United States) listened to vocal expressions of nine positive and nine negative affective states recorded by actors from their own nation. In response, they wrote open-ended judgments of what they believed the actor was trying to express. Responses cut across the chronological emotion process and included descriptions of situations, cognitive appraisals, feeling states, physiological arousal, expressive behaviors, emotion regulation, and attempts at social influence. Accuracy in terms of emotion categories was overall modest, whereas accuracy in terms of valence and arousal was more substantial. Coding participants' 57,380 responses yielded a taxonomy of 56 categories, which included affective states as well as person descriptors, communication behaviors, and abnormal states. Open-ended responses thus reveal a wide range of ways in which people spontaneously perceive the intent behind emotional speech prosody.

Keywords: appraisal theory; emotion process; emotion recognition; free responses; speech prosody; vocal expression.

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> Exp Clin Psychopharmacol. 2021 Apr 29;10.1037/pha0000459. doi: 10.1037/pha0000459. Online ahead of print.

Reinforcer pathology of internet-related behaviors among college students: Data from six countries

Samuel F Acuff [1], Angelina Pilatti [2], Megan Collins [3], Leanne Hides [3], Nutankumar S Thingujam [1], Wen Jia Chai [4], Wai Meng Yap [1], Ruichong Shuai [3], Lee Hogarth [3], Adrian J Bravo [5], James G Murphy [1]

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PMID: 33914568 PMCID: PMC8553798 (available on 2022-10-29) DOI: 10.1037/pha0000459

Abstract

Research has demonstrated that repeated engagement in low-effort behaviors that are associated with immediate reward, such as Internet use, can result in a pathological reinforcement process in which the behavior is increasingly selected over other activities due, in part, to a low availability of alternative activities and to a strong preference for immediate rather than delayed rewards (delay discounting). However, this reinforcer pathology model has not been generalized to other Internet-related behaviors, such as online gaming or smartphone use. Given the widespread availability of these technologies, it is also important to examine whether reinforcer pathology of Internet-related behaviors is culturally universal or culture-specific. The current study examines relations between behavioral economic constructs (Internet demand, delay discounting, and alternative reinforcement) and Internet-related addictive behaviors (harmful Internet use, smartphone use, online gaming, and Internet sexual behavior) in a cross-sectional sample of college students (N = 1,406) from six different countries (Argentina, Australia, India, Malaysia, the United Kingdom, and the United States). Using structural equation modeling, Internet demand was associated with harmful Internet use, smartphone use, and online gaming; delay discounting was associated with harmful smartphone use; and alternative reinforcement was associated with harmful Internet and smartphone use. The models were partially invariant across countries. However, mean levels of behavioral economic variables differed across countries, country-level gross domestic product, person-level income, and sex at birth. Results support behavioral economic theory and highlight the importance of considering both individual and country-level sociocultural contextual factors in models for understanding harmful engagement with Internet-related behaviors. (PsycInfo Database Record (c) 2022 APA, all rights reserved).

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Relative influence of overall and central body adiposity on lung function and development of lung function predictive model for adolescents in Tripura

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Description Background:

Population-specific reference values are necessary for maintaining the reliability of pulmonary function evaluation. There are very few studies that have included body adiposity markers as the predictors of lung function, instead of age and height.

Objectives:

A gender-specific lung function predictive model of adolescents was developed using overall and central adiposity markers. The relative influences of both markers on pulmonary functions were also evaluated.

Methods:

Anthropometric and pulmonary function parameters of the subjects were recorded. The percentage body fat, fat mass (FM), fat-free mass (FFM), and body density were calculated. Statistical analysis was done using SPSS 16.0.

Results:

Significant differences between sexes for anthropometric measures were observed. The mean values of waist circumference (71.94±2.33 mm for female vs. 71.37±2.25 mm for male; P< 0.0005), body ...

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Neuroendocrine control of cocoon production in native earthworm *Perionyx ceylanensis* subjected to seasonal variation

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Abstract

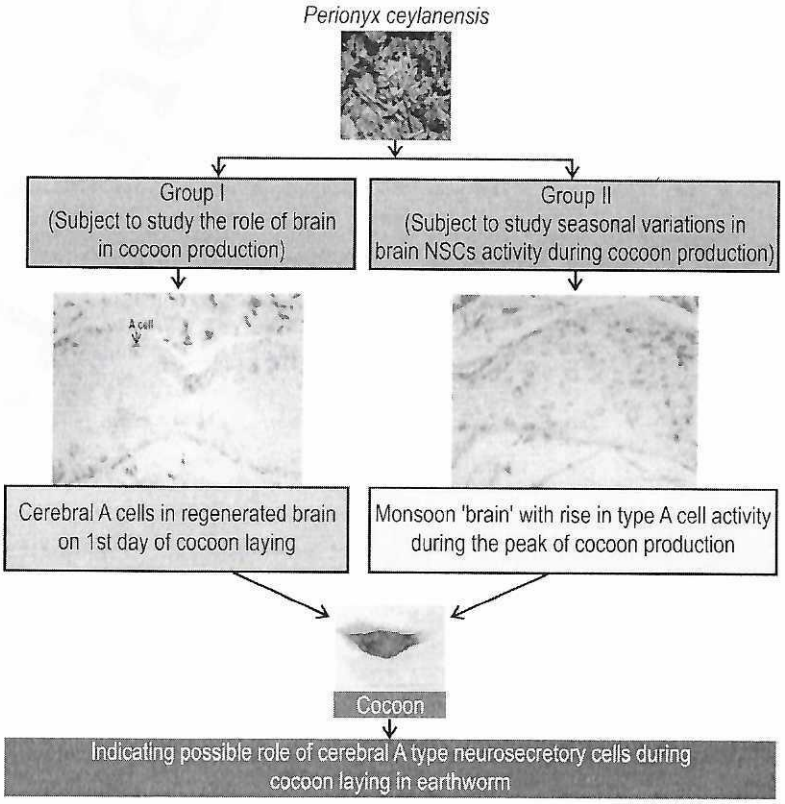
Aim: The aim of the present study was to observe the role of cerebral ganglionic neurosecretory cells (NSCs) during cocoon production in native earthworm species *Perionyx ceylanensis* subjected to amputation and seasonal variations.

Methodology: Histological studies (using Aldehyde Fuchsin and Chrome Alum Haematoxylin Phloxin stain) were carried out on brain NSCs in the two groups of earthworms (Group I and Group II) maintained in earthen culture pots (2L) with cowdung as food. Group I comprised of brain amputed earthworms was subjected to observe the role of brain NSCs in production of cocoon and Group II earthworms subjected to seasonal changes in the cerebral NSCs during cocoon production. Five replications were kept for Group I (1 individual per pot) and Group II (1 pair per pot).

Results: Group I debrained earthworms started to lay cocoons from the 31st day following regeneration of cerebral ganglionic type A NSCs. In group II worms the highest neurosecretory activity was registered in the cerebral type A cells, especially during monsoon coinciding with the hike of cocoon generation.

Interpretation: Appearance of type A NSCs in regenerated brain and peak of type A neurosecretory cell activity during peak reproductive period of earthworm species (as indicated by peak of cocoon production) indicates the possible role of cerebral type A NSCs in cocoon laying.

Key words: Amputation, Cocoon production, Neuroendocrine system, Neurosecretory cells, *Perionyx ceylanensis*



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