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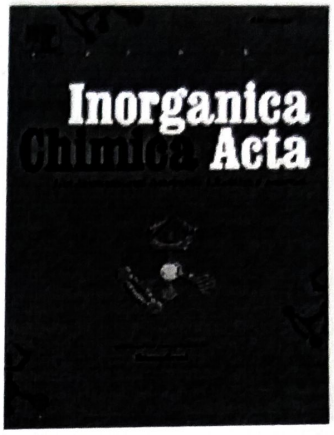
A STUDY ON THE PHYSIOLOGICAL, BIOCHEMICAL AND LIPID CONTENT BEHAVIOUR OF MICROALGA CHLORELLA SP. IN RESPONSE TO IRON (III)

YOGESH NEGI, JONETO NONGMAITHEM, FRANKIE J. LALOO AND SAMRAT ADHIKARI

Abstract

Microalgae are potent organisms for biofuel production and their productive ability can be further enhanced when exposed to various environmental stress conditions. To identify the appropriate conditions suitable for high biomass and lipid productivity, Chlorella sp. was isolated from iron leaching areas and cultivated under various Fe3+ concentrations at pH 6.8. Highest growth and biomass productivity was reported for the group supplemented with 12µM FeCl3.Further, with the optimal iron concentration identified, the cells were subjected to both Fe3+ (12µM) and pH stress (5 and 8). The results showed that the total lipid content for Chlorella sp. cultured with 12 µM FeCl3 at pH 8.0 and those grown at pH 5.0 stress achieved 52.8% and 38.8% biomass by dry weight and was 7.3 and 5.3 times respectively higher than the control group at pH 6.8. The physicochemical abilities of these cells at 12 µM Fe3+ was also analyzed to assess the effect of iron on these microbial cells.

Accepted Manuscript



Research paper

Pyridine aided progression from amorphous to crystalline bis([5-(aryl)-1-diazenyl]quinolin-8-olato)zinc(II) compounds – Solution and solid-state structural characterization, nanoparticle formation and antibacterial activity

Tushar S. Basu Baul, Khrawborlang Nongsiej, Koel Biswas, Santa Ram Joshi, Herbert Höpfl

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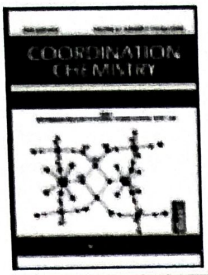

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Cobalt(II) complexes with pyridine and 5-[(*E*)-2-(aryl)-1-diazenyl]-quinolin-8-olates: Synthesis, electrochemistry and X-ray structural characterization

Tushar S. Basu Baul, Khrawborlang Nongsiej, Bruno G. M. Rocha & M. Fátima C. Guedes da Silva

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On the uniqueness of the factorization of power digraphs modulo n

Amplify Sawkmie (*) – Madan Mohan Singh (**)

Abstract – For each pair of integers $n = \prod_{i=1}^{r} p_i^{e_i}$ and $k \geq 2$, a digraph $G(n,k)$ is one with vertex set $\{0, 1, \ldots, n-1\}$ and for which there exists a directed edge from x to y if $x^k \equiv y \pmod{n}$. Using the Chinese Remainder Theorem, the digraph $G(n,k)$ can be written as a direct product of digraphs $G(p_i^{e_i}, k)$ for all i such that $1 \leq i \leq r$. A fundamental constituent $G_P^*(n,k)$, where $P \subseteq Q = \{p_1, p_2, \ldots, p_r\}$, is a subdigraph of $G(n,k)$ induced on the set of vertices which are multiples of $\prod_{p_i \in P} p_i$ and are relatively prime to all primes $p_j \in Q \setminus P$. In this paper, we investigate the uniqueness of the factorization of trees attached to cycle vertices of the type 0, 1, and (1, 0), and in general, the uniqueness of $G(n,k)$. Moreover, we provide a necessary and sufficient condition for the isomorphism of the fundamental constituents $G_P^*(n,k_1)$ and $G_P^*(n,k_2)$ of $G(n,k_1)$ and $G(n,k_2)$ respectively for $k_1 \neq k_2$.

Mathematics Subject Classification (2010). 05C20, 05C05, 11A15, 11A07.

Keywords. Power digraph, direct product, uniqueness of factorization, Chinese remainder theorem.

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Case Studies on the Problems of Single Mothers and their Children in Shillong City of Meghalaya

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ABSTRACT

This Case Studies on Problems of Single Mothers and their Children in Shillong City of Meghalaya has been designed to spell out the problems faced by the single mothers and their children. Single mother status is created in a number of ways, death of one parent, divorce, separation, desertion and Annulment.

Temperamental incompatibility, mutual distrust and neglect, lack of satisfaction in sex, impulsive behaviour, adultery, cruelty by husband and in-laws, addiction to alcohol and drugs by husbands are few reasons contributing towards breakdown of marriages caused by divorced, separation, desertion or annulment;

The researcher has planned the entire process of research work in such a way that it can focus on the social, family, psychological and economic problems of the single mothers and their children and at the same time it can suggest some strategies to cope with these said problems.

The researcher restricted her field of study only to the married Khasi and Jaintia single mothers living in Shillong city of Meghalaya. All the information regarding the research was collected from the married single mothers who are within the age group of 18 - 45.

The aim of the study is to highlight the socio-cultural and economic factors that determine the problems of single mothers and their children in Shillong city of Meghalaya. In order to understand and ascertain the in-depth conditions of single mothers, the researcher used checklist to collect the stories of 14 single mothers.

KEY WORDS: Single Mothers, Children, Problems, Case Studies, Experiences.

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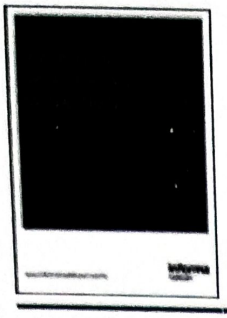

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The estrogen-related receptors in metabolism and cancer: newer insights

Harmit S. Ranhotra

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Public Perception on Single Motherhood in Shillong, Meghalaya

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Abstract

This paper is a study of the problems of single mothers and their children in the state of Meghalaya with special reference to the city of Shillong. Single mothers are women without partners. They are living with one or more children without the physical assistance of their husbands and there are no fathers or stepfathers in the picture. In this study single mothers families are families with a child or children under 18 (eighteen) years old headed by a mother who is widowed, divorced, separated or deserted and not remarried. This study was conducted in Shillong city of Meghalaya. The primary data was collected from 50 key informants who serve as lynchpins to various agencies like community leaders, religious leaders and heads of organization working for the welfare of single mothers and their children. The most thriving NGOs of the state was being selected namely North East Network, Iohlynti, Lamjingshai, Impulse, New Hope, Rilang Shelter Home, Seven Day Adventist Training Centre, Youth Centre, Reach Shillong Ministry and Bar Association. Concerning GOs the researcher has selected six GOs including Women Police Station, Family Counselling Centre, Child Line, District Social Welfare, Integrated Child Protection Unit and State Commission for Women purposively.

Key words: Single Mothers, Problems, Key Informants, Non- Government Organization, Government Organization, Challenges.

Introduction

Families are of various types but of all family types, single parent families have made the most gains during the past few decades and often, a single parent family is a mother with her children. The U.S. Census Bureau (2012) highlighted that out of 12.2 million single parent families; more than 80 percent were headed by single mothers. 1 in 3 children, a total of 15 million are being raised without a father. Of that group, nearly half live below the poverty line.

Parents are the basic unit of society primarily responsible for child-rearing functions. They are responsible for providing physical necessities, emotional support, learning opportunities, practical assistance, information, supervision, moral guidance, building self-esteem and resilience in children. Both parents have their own roles to play in families for child development.

Motherhood is not easy and single motherhood is tougher as it entails added responsibilities. Single motherhood is a huge challenge in itself as they have to deal with the situation where they have lost their loved one and at the same time, they need to take up the responsibilities of rearing the children and life as a whole. Kotwal *et al.* (2009) in their study "Problems Faced by Single Mothers" revealed that financial problem was the main stressor for majority of the single mothers. The emotional life of the single mothers was also affected by their single status. Majority of the single mothers reported their feeling of loneliness, helpless, hopeless, lack of identity and lack of confidence.

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EFFECT OF MERCURY ON THE GROWTH AND BIOCHEMICAL BEHAVIOR OF *NOSTOC MUSCORUM* AND *ANABAENA VARIABILIS*

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ABSTRACT

Cyanobacteria are a highly diversified group of photosynthetic organisms which can be exploited as a potential candidate for bioremediation processes. The present study evaluates the toxic effect of a heavy metal, mercury (Hg^{2+} (II)), on the growth and biochemical aspects of *Nostoc muscorum* and *Anabaena variabilis*. The results depicted negative effects of Hg^{2+} on cyanobacteria by hampering normal growth and physiological activities. The treated cells showed diminishing growth pattern and decrease in the photosynthetic pigments. Significant decline was also revealed in the biomass and lipid content. The LC_{50} value of Hg was determined to be 0.6µM for both the cultures. Activity of the enzymes involve in nitrogen metabolism such as Glutamine Synthetase (GS), Nitrate Reductase (NR) and Nitrite Reductase (NIR) were studied and showed reduced activity. This decreased activity also correlates with the reduction in the heterocyst frequency as obtained in the results. In contrast, the enzyme superoxide dismutase (SOD) and proline content concerned with stress management in cyanobacterial cells showed significant increase in activity. The result obtained in the present study exemplifies the cytotoxic environment created by the Hg^{2+} ions on the microbial cultures by altering their membrane's physiological functions. Thus, causing leaching of photosynthetic pigments leading to decreased photosynthetic efficiency and consequently restraining growth. The growth inhibiting effect of Hg^{2+} ions was also evident from the reduced activity of enzymes entailed with assimilation and uptake of nitrogen, resulting in decline in heterocyst frequency. Furthermore, the apparent increase in cell's SOD and proline content can be ascribed to the production of reactive oxygen species (ROS) due to heavy metal stress created by the Hg^{2+} ions.

KEYWORDS: ***Cyanobacteria, Hg^{2+}, Heavy metal stress, Growth, Biochemical assays, antioxidant***

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FULL PAPER

WILEY Applied Organometallic Chemistry

Tweaking the affinity of aryl-substituted diazosalicylato- and pyridine ligands towards Zn (II) and its neighbors in the periodic system of the elements, Cu (II) and Cd (II), and their antimicrobial activity

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A series of six new Zn (II) compounds, viz., $[Zn(HL^{ASA})_2(Py)_2]$ (1), $[Zn(HL^{MASA})_2(Py)_2]$ (2), $[Zn(HL^{MASA})_2(4\text{-}MePy)_2]$ (3), $[Zn(HL^{CASA})_2(4\text{-}MePy)_2]$ (4), $[Zn(HL^{BASA})_2(Py)_2]$ (5), $[Zn(HL^{BASA})_2(4\text{-}MePy)_2]$ (6) and representative Cu (II) and Cd (II) complexes, viz., $[Cu(HL^{ASA})_2(Py)_2(H_2O)]$ (7) and $[Cd(HL^{BASA})_2(Py)_3]$ (8) [$(HL^{XASA})^-$ = para-substituted 5-[(E)-2-(aryl)-1-diazenyl]-2-hydroxybenzoate with X = H (ASA), Me (MASA), Cl (CASA) or Br (BASA); Py = pyridine; 4-MePy = 4-methylpyridine] have been synthesized and characterized by spectroscopic techniques and single-crystal X-ray diffraction analysis. The structural characterization of the compounds revealed distorted tetrahedral (1–6), square-pyramidal (7) and pentagonal-bipyramidal (8) coordination geometries around the metal atom, in which the aryl-substituted diazosalicylate ligands are coordinated only through the oxygen atoms of carboxylate groups, either in an anisobidentate or isobidentate mode; meanwhile, the 2-hydroxy groups of the monoanionic ligand $(HL^{XASA})^-$ are involved only in intramolecular O-H···O hydrogen bonds with the carboxylate function. In the crystal structures of 1–8, the complex molecules are assembled by π-stacking interactions giving mostly infinite 1D strands. The intermolecular binding in the solid state structures is accomplished by diverse additional non-covalent contacts including C-H···O, C-H···N, C-H···π, C-H···Br, O···Br, Br···π and van der Waals contacts. Although the primary and secondary ligands in the Zn (II) complex series 1–6 carry different substituents at the periphery (X = H, Me, Cl, Br for $(HL^{XASA})^-$ and R = H, Me for 4-Py-R), five of the crystal structures were isostructural. Additionally, the antimicrobial activity of the pro-ligands H_2L^{XASA} and their Zn (II), Cu (II) and Cd (II) compounds were studied in a comparative manner, showing high sensitivity (IZD ≥ 20) against Bacillus subtilis.

KEYWORDS
antimicrobial activity, diazo salicylate and pyridine ligands, SCXRD structure elucidation, zinc/copper/cadmium

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A study on the differentiation of filamentous cyanobacterial isolates using DNA fingerprinting approach

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The present study investigates the implication of DNA fingerprinting in discrimination of class isolates collected from a spread of habitats in south west Khasi Hills district of Meghalaya, India. Five totally different primers i.e., M13, enterbacterial repetitive intergenic consensus (ERIC), short tandem repetitive repeats (STRRs) 1A & B and long tandem repetitive repeats (LTRRs), derived from repetitive sequences gift within the ordering of true bacteria, were utilized. The generated knowledge was then evaluated for fingerprinting exploitation procedure and unweighted pairgroup method of arithmetic average (UPGMA) based dendrograms. Clear and variable stripe patterns were obtained for every of the targeted genomic regions used, LTRR being the sole exception. The stripe patterns delineate the existence of 2 basic distinct populations of true bacteria among the 19 isolates. The UPGMA cluster analyses in addition, disclosed the presence of numerous lineages among the isolates. On examination the resolution capability of the four genomic regions studied, it had been seen that, with the exception of LTRR, all the opposite regions hold smart resolution and therefore the ability to differentiate between numerous class populations. The results of the current study indicate the incidence of genetic variants among the 19 morphologically identical isolates of filiform cyanobacteria. Additionally, the study additionally explicates the quality of DNA fingerprinting supplemented with UPGMA cluster analysis as a speedy, economical and value effective tool for differentiating among morphologically identical populations.

Keywords: Cyanobacteria; genetic diversity; DNA fingerprinting; UPGMA cluster analysis

Introduction

The phylum cyanobacteria represents the largest sub-groups of Gram negative microorganisms characterized by the ability to perform photosynthesis. Besides being oxyphototrophic, some of the cyanobacteria are also endowed with the capability of fixing atmospheric nitrogen[1-6]. An additional aspect of cyanobacteria being a subject of research interest lies in the fact that they are amongst the ancient evolutionary lineages of phototrophs believed to have originated during the early Pre-cambrian super eon of the geological time scale (approx 2.6-3.5 Bya)[7-8]. With immense potential, cyanobacteria offer diverse applications in bioremediation, biofertilizers, bio-monitoring of soil fertility and water quality[9-12].

Conventional approaches for identification of cyanobacteria have mostly relied on morphological characters; which, however, tends to suffer from uncertainties and is often misleading[13-17]. Furthermore, assessment of genetic diversity among cyanobacterial population has also been problematic owing to their small size and non distinctive phenotypic characteristics (Rasmussen and Svenning). With the advancement in the field of molecular biology, a number of techniques have been made available for identification, delineation and studying genetic diversity of cyanobacteria. In this context, 16S rRNA sequence analysis, restriction fragment length polymorphism (RFLP), random amplified polymorphic DNA (RAPD) and amplified ribosomal DNA restriction analysis (ARDRA) analyses have been successfully employed for molecular characterization, identification and resolving taxonomic and phylogenetic issues among the various cyanobacterial taxa[18-26]. With regard to investigation of genetic diversity, PCR based DNA finger printing have been considered as a valuable tool[27-29]. Furthermore, in comparison to the other available techniques, such as 16S rRNA and whole genome sequence analysis, which are commonly used for assessment of microbial diversity, DNA finger printing is a cost effective technique and can be routinely used. In this context, the repetitive sequences, which constitute an important part of

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Synthesis, crystal structures, magnetic properties and antimicrobial screening of octahedral nickel(II) complexes with substituted quinolin-8-olates and pyridine ligands

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ABSTRACT

New nickel(II) compounds, viz. *trans*-[Ni(L^{HAQ})$_2$(Py)$_2$]·C_6H_6 (**1**), *cis*-[Ni(L^{HAQ})$_2$(3-MePy)$_2$] (**2**), *cis*-[Ni(L^{2-MeAQ})$_2$(3-MePy)$_2$] (**3**), *trans*-[Ni(L^{4-MeAQ})$_2$(Py)$_2$]·C_6H_6 (**4**), *trans*-[Ni($L^{4-OMeAQ}$)$_2$(Py)$_2$]·C_6H_6 (**5**), *trans*-[Ni($L^{4-OEtAQ}$)$_2$(Py)$_2$]·C_6H_6 (**6**), *trans*-[Ni(L^{4-BrAQ})$_2$(Py)$_2$]·C_6H_6 (**7**) and *trans*-[Ni(L^{4-ClAQ})$_2$(3-MePy)$_2$]·2(3-MePy) (**8**) (primary ligands: L^{XAQ} = substituted 5-[(*E*)-2-(aryl)-1-diazenyl]quinolin-8-olate; secondary ligands: Py = pyridine or 3-MePy = 3-methylpyridine) have been synthesized and characterized by elemental analysis, IR, UV–vis spectroscopy. The magnetic susceptibilities of the compounds were also measured. Single-crystal X-ray diffraction analysis of the compounds revealed octahedral geometries with *trans* configurations for **1**, **4**–**8** and *cis* configurations for **2** and **3**. The occurrence of intramolecular Ni···$H_{pyridine}$ interactions in **2** and in **3**, may account for additional stabilization of their assemblies at least in the solid state. The effective magnetic moment (μ_{eff}) in the range 3.02–3.40 BM agree with the expected values for octahedral Ni(II) cations with two unpaired electrons. Ni(II) compounds were also screened for their antimicrobial activity.

1. Introduction

Quinolin-8-ols (HL^Q) are good metal ion chelators [1–9] and their derivatives 2-(quinolin-8-yloxy)propionates, 5-aryl-8-hydroxyquinolines [10–12] and 8-aminoquinoline [13–16] were widely studied. Metal compounds of HL^Q were extensively used in photochemical processes [17–21], optical sensing [22–24] or as organic light-emitting diodes [25–29]. Other applications of HL^Q encompass thin film formation of nano-sized metal quinolin-8-olates [30] and nanobelt structures [31] involving 3d metals. The coordination behavior of 5-[(*E*)-2-(aryl)-1-diazenyl]-quinolin-8-ol (HL^{XAQ}) towards M(II)/M(III) ions has been developed [32–39] with recent focus on their use as colorimetric sensors [40] as well as in the extraction of Cu(II) and Ni(II) at low concentrations [41]. Nanosized [Co(L^{XAQ})$_2$] thin films with energy gaps of 4.01 eV [42], HL^{XAQ} and its M(II) complexes as dyes in polyester fabrics [43], HL^{XAQ}-Zn(II) complexes as zinc source for nano-structured materials [44], and promising non-linear optical behavior of some HL^{XAQ} with 3d transition metal complexes [32d], are recent research developments.

Despite such progresses crystal structures of the HL^{XAQ} complexes are scarce. The N- and O- atoms of HL^{XAQ} as bidentate ligand can bind both medium and hard metal ions and give rise to different geometries. Two molecules of HL^{XAQ} can give rise to square-planar (e.g., with Cu(II) ions) and tetrahedral complexes (e.g., with Cu(I) or Co(II) ions). Thus, for obtaining stable six coordinate octahedral metals complexes derived from HL^{XAQ}, additional ancillary ligands such as pyridines are needed. Pyridine derivatives not only enhance solubility therefore ensuring the homogeneity of the reaction mixture, but also modulate the acidity of the metal center. On the basis of this hypothesis, the pro-ligands HL^{XAQ} have been utilized for designing various types of discrete compounds, frequently involving Co(II) and Zn(II) cations with different

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RESEARCH ARTICLE OPEN ACCESS

Antibacterial potential of Actinobacteria from a Limestone Mining Site in Meghalaya, India

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Abstract

This work attempts to assess the antimicrobial potential of actinobacteria isolated from limestone mining sites which hitherto, is an under-explored niche for exploring novel bioactive metabolites. Actinobacteria were selectively isolated from Mawsmai, Meghalaya, India, a limestone mining area, using different pretreatment methods. Forty-seven isolates were obtained, which were identified based on their morphological, biochemical and chemotaxonomical characteristics. *Streptomyces* was the dominant cultivable genera which constituted 76% of the isolates cultivated. All the isolates were screened for antimicrobial activity against three Gram-negative viz. *Escherichia coli*, *Pseudomonas aeruginosa* and *Klebsiella pneumoniae*, and three Gram-positive bacteria viz. *Staphylococcus aureus*, *Bacillus subtilis* and *Micrococcus luteus* and besides, two candidal species viz. *Candida albicans* and *C. tropicalis*. 19% of the total isolates showed antibacterial activity against at least one of the test bacterial strains used. The identity of the four bioactive isolates viz. LD-21, LD-29, LD-34 and LD-39 was confirmed as *Streptomyces* sp. on the basis of their 16S rDNA sequence and 16S rRNA secondary structure analysis. These isolates showed antibacterial activity against at least two Gram-positive bacteria and all the four harbored at least one of the three biosynthetic gene clusters viz. type-I and type-II polyketide synthases and non-ribosomal peptide synthetase which are related to synthesis of bioactive metabolites.

Keywords: *Streptomyces,* Antimicrobial, Biosynthetic gene clusters, 16S rRNA secondary structure.

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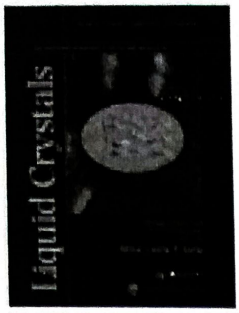

Liquid Crystals

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Comparative Raman study of two laterally fluorinated LC compounds having different terminal chains

Marpliephar Lyndem, Roman Dabrowski & Ayon Bhattacharjee

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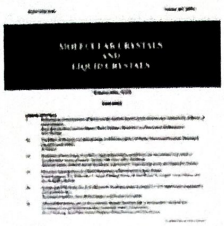

Molecular Crystals and Liquid Crystals

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Raman and FTIR Study of a 2, 3'-difluoro-4''-isothiocyanato-4-propyl-1,1':4',1''-terphenyl compound or C3P(3F)P(3F)P-NCS

Marpliephar Lyndem, Ayon Bhattacharjee & Roman Dabrowski

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De-etiolation Enhances Phototropism by Modulating NON-PHOTOTROPIC HYPOCOTYL 3 Phosphorylation Status

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One-sentence Summary

Phototropism is enhanced by seedling de-etiolation and is achieved by a molecular rheostat that fine-tunes the phosphorylation and localization status of the phototropic signaling component, NPH3.

Author Contributions

Article

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Migrants and Their Social Networks: A Study of Kuki Migrants in Delhi

Thanggoulen Kipgen[1]
Biswambhar Panda[1]

Abstract

This paper discusses the role and importance of social networks in the migration process. It explores the formation of social networks among the Kuki migrants in Delhi. Drawing insights from the theoretical and conceptual literature on social networks and based on field observations and personal narratives of migrants, the study analyses the importance of social networks for migrants and explains how social networks help the migrants cope with a new social environment. The Kuki migrants have been classified into two categories, namely 'pioneer' and 'follower' migrants. While pioneer Kuki migrants hardly had any ties and merely depended on 'weak ties', it was follower migrants who took the benefits of ethnic and kinship networks. The study conclusively found that social networks have been instrumental though various pull factors at the place of destination and push factors at the place of origin have contributed for Kuki migration to Delhi. The migrants have formed ethnic clusters, which have turned out to be a survival strategy in a new social milieu. The social networks not only have helped migrants to deal with challenges and constraints in an alien environment but also instilled a sense of confidence in them to overcome psychological stress and isolation.

Keywords

Pioneer Kuki migrants, follower Kuki migrants, kinship networks, ethnic networks, ethnic clusters

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Title

Endogenous Activity of Glutamate Dehydrogenase from Different Tissues of Mice at Various Postnatal Ages: Effects of Substrates and Co-substrates on the Activity of the Enzyme from the Liver of Two Ages.

Authors

Wahlang, James; Syiem, Donkupar

Abstract

Glutamate dehydrogenase (GDH) an enzyme which catalyze the reversible formation of glutamate from α-ketoglutarate, occupies a central position in mammalian nitrogen metabolism since the reaction which it catalyze provides the major pathway by which ammonia become bound to the αcarbon atom of an α-ketoacid to generate glutamate. A comparative study on the specific activity (U/mg) of GDH was assayed in various tissues and at different postnatal ages of normal mice. The result showed higher activity in the lower age group for most of the tissues under study. However, the brain enzyme exhibited increased activities at mature stages, indicating an age- and tissue-specific pattern of distribution. Effects of substrates and co-substrates studies of partially purified GDH, including isolation and purification of the enzyme from the mice liver tissue are also reported.

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A survey of edible fresh fish resources in Iewduh (Bara Bazaar) in Shillong, Meghalaya

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Abstract: Indian fisheries are an important sector of food production, providing nutritional and livelihood security to a vast majority of the population and contributes significantly to the foreign exchange earnings. There is a big demand of fish in north-eastern states of India. Fish market infrastructures include wholesale market, retail market and fish shops. Iewduh, also called Bara Bazaar, is one of the oldest and largest traditional market and trade centre in the northeast. A variety of fish are being sold in Iewduh in Shillong, Meghalaya. Majority of the fishes are sourced from other parts of the country. A total of 30 distinguishable taxa were observed in the market, representing 18 families. There was a predominance of different carp species and a number of catfishes were also available.

Keywords: *Fresh fish resources, fish market, Iewduh, carps, catfishes*

1. INTRODUCTION

Meghalaya, the 'Abode of Clouds' is one of the Seven Sisters states of northeast region of India. It features a total population of 29,66,889, as per the 2011 census. The state is surrounded by Assam to its east, north and west, and by Bangladesh to its south. The capital city of Meghalaya, as well as, the district headquarter of East Khasi Hills District, is Shillong (25.57°N 91.88°E). Iewduh, situated at the heart of Shillong, is one of also called Bara Bazaar, the oldest and largest traditional market and commercial hub in northeast India and is under the direct management of Syiem of Mylliem. It has large sections dedicated to local fruits, vegetables, fish, honey, etc. Betel nuts and leaves form one large section of the market, while fish and other meat form the other. Fishes sold in the market are mostly imported from other states of India though a small portion of fish comes from local fisheries.

Indian fisheries are an important sector of food production, providing nutritional and livelihood security to a vast majority of the population and contributes significantly to the foreign exchange earnings. There is a big demand of fish in north-eastern states like Arunachal Pradesh, Assam, Tripura, Manipur, Meghalaya and Nagaland. These north-eastern states are fulfilling their fish requirement from West Bengal, Odisha, Andhra Pradesh and Bihar. West Bengal

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Aspiration for Social Worker: a way to subtle art of facilitation

Rituparna Rajendra[1] and Sutanuka Deb[2]

Abstract:

In the realm of today's social work context it isimporiant to uphold its productivity with the enhancement of people understanding and appreciating it with the loop to strength its grip. The core vision that social worker visualizes is that the dynamics of facilitation should endeavor to brings in changes in a systematic and scientific way. Therefore it has become a real time challenge for many to make things work as they lack real practice and how to deal with it Let this article unfold certain facts on facilitation in order to have a better initial foundation of the entire topic.

Key Words: Social Worker, Facilitation, WASH

Facilitation is a way of working with people which enables and empowers people to carry out a task or perform an action. The facilitator does not perform the task, but uses certain skills in a process which allows the individuals/group to reach their decision/ set their goal/learn a skill. Facilitation is a developmental educational method which encourages people to share ideas, resources, opinions and to think critically in order to identify needs and find effective ways of satisfying those needs.

Facilitation is a method that can be used in many settings like groups of people or individuals. The following are examples of where facilitation takes place:

- Therapists may use facilitation with clients.
- Teachers may use facilitation skills to encourage learners to think and develop opinions and ideas.
- Career planners may use facilitation skills to enable clients to chart a career path.
- A community activist may use facilitation skills to discover the needs of people in a particular area.

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Single Motherhood: A Structural Perspective

Dr. Wandaia Syngkon

Abstract

The purpose of this article is to describe the contributions that can be made by social workers to improve the daily life of single mothers' families psychologically, economically and socially. The researcher chose this section of women for the following reasons: mothers with husbands who are an integral part of a stable social unit, such as family or kinship group, do not have to seek special avenues of adjustment and orientation on individual terms. On the other hand, single mothers face new problems which are new for other women. These issues are related to new roles, new status, adjustment and acceptance, and integration into society. This study was conducted in Shillong city of Meghalaya with single mothers and their children belonging to the Khasi and Jaintia communities. The study was limited to two hundred (200) respondents, i.e. one hundred (100) single mothers, fifty (50) children of single mothers and fifty (50) key informants, including heads of organizations working for women and children, priests, pastors and chiefs from different localities in Shillong. (6) Governmental organizations and nine (9) non-governmental organizations working for the welfare of women and their children, which are located in Shillong City, were interviewed, as no governmental and non-governmental organization works exclusively for single mothers and their children. The age group of the targeted single mothers is between 18-45 year old and their children in the 8-14 age groups. The inclusion of respondents was limited only to divorced, separated, deserted, widowed, single mothers whose marriages were annulled and those who have children of their own.

Keywords: *Single mothers, Children, Structural Theory, Social Work*

Introduction

Parenting is the act or process of raising children. On the other hand, single parenting is exactly the same, but with a single parent raising their child or children. The single-parent family consists of a parent who raises one or more children on their own. Often, a single-parent family is a mother with her children, although there are single fathers. Single-parent families are families with a child or children under 18 (eighteen years of age) led by a widowed, divorced, separated or deserted parent who is not remarried. Single parenting

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Unique breeding activity and oviposition in Annandale's high-altitude tree frog, *Kurixalus naso* (Annandale, 1912) in Meghalaya, North East India

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The present study highlights the unique characteristics of the breeding activity and oviposition of Annandale's high-altitude tree frog, *Kurixalus naso* (Annandale, 1912) at Mawsynram, Meghalaya, North East India. After the cold, dry, winter months (September–January), the first rainfall in February triggers the onset of a short breeding activity of the species, which lasts for 3–4 weeks during February to March. The first shower causes an increase in soil moisture content and decrease in soil temperature. Immediately after the first showers, males make their advertisement calls, followed by females engaging in amplexus with the males and ovipositing in the moist soil. The females come only once to the breeding site and leave after mating; parental care is provided by the males. Multiple amplecting pairs at the breeding site are seen inside the burrows and some are observed to amplect in the open soil surface, lasting for 5–6 h. No aggregation and competition among the males is observed. The amplecting females lay eggs inside the excavated burrows and the males, using their hind limbs, expose the eggs by pushing them to the mouth of the burrowing hole. Sometimes, the females oviposit at the base of hollow tree trunks and occasionally in the open soil surface. The eggs are mixed with the soil and they resemble perhaps masquerade as seeds. Most frogs display a biphasic life cycle. However, *K. naso* shows a distinct non-aquatic oviposition with aquatic larva. Further, soil moisture content and temperature may support the development of embryos in open soil surfaces and burrows.

Keywords: Amplexus, breeding, burrows, *Kurixalus naso*, oviposition.

ANURANS have the highest diversity of breeding behaviours among all vertebrate taxa[1,2]. They display a biphasic life cycle and breed in a variety of habitats such as temporary rainfed ponds, permanent ponds, cemented tanks, streams and rivers. In addition, they select different habitats, especially those that have vegetation cover, as it provides shelter and calling sites[3]. Anurans may be

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feature

Human microbial metabolite mimicry as a strategy to expand the chemical space of potential drugs

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The concept of small-molecule mimicry even of weak microbial metabolites present in rodents and humans, as a means to expand drug repertoires, is new. Hitherto, there are few proof-of-concept papers demonstrating utility of this concept. More recently, papers demonstrating mimicry of intestinal microbial metabolites could expand the drug repertoire for diseases such as inflammatory bowel disease (IBD). We opine that, as more functional metabolite–receptor pairings are discovered, small-molecule metabolite mimicry could be a significant effort in drug discovery.

Introduction

Biomimicry is an invaluable tool for the discovery of new solutions to problems afflicting humans. Examples include the design of Velcro, which mimics burdock burrs, shark denticles used to design surfaces (riblets) that reduce air drag, beehive patterning of circuits used to balance loads during peak hours, and design of energy-conserving pools that imitate soap bubbles [1]. Another example relates to biology and predation. Various organisms, such as caterpillars, use eyespots to give predators the impression of a sizeable toxic animal (e.g., snake's head) [3].

Biomimicry has been explored in therapeutics [4,5], but there is a real paucity of emerging concepts and drugs [6]. In therapeutics, biomimicry would theoretically yield potent drug-like molecules with minimal liabilities (i.e., adverse effects). This assumption is made based on the similarity of the small molecule to the original parent metabolite that it mimicked, no significant metabolic liabilities, as well as overall safety in animal studies. These small molecules could improve the chemical space utilized in traditional drug discovery efforts (Fig. 1) [7]. We base our concepts on the debated rationale that Nature minimizes the cost of development of molecules that have the most effect on their targeted goal with minimal effects on its environment (i.e., untargeted liabilities). As an example, several invading plant pathogens (e.g., Xanthomonas), when present within their host, induce the expression of a specific protein, RaxX. RaxX is a mimic of a plant peptide hormone, plant peptide containing sulfated tyrosine (PSY). The rice immune receptor XA21 detects sulfated RaxX preferentially over endogenous peptide PSY. The binding of RaxX to XA21, in turn, allows control over host signaling and immunity that protects both the host and the pathogen [8]. Sulfated RaxX–XA21 interactions are specific, and there are no known other receptors that are engaged by RaxX [9]. In this example, Nature conserves biochemistry and targets specific host proteins without collateral damage, thus ensuring pathogen–host survival. One possible conjecture is that Nature-made metabolites (and proteins) that have evolved to reach and influence their specific target would have limited toxicity to the host (e.g., unless they are purposefully made to be toxins, antibiotics, etc.). However, caution is required because this could also simply be coevolution, whereby the host has evolved to avoid toxicity from the metabolite (or protein).

Biomimicry and drug discovery

Bioinspired chemical libraries are clearly changing traditional drug discovery approaches. For example, Thireou et al. used a two-filter chemical screening approach, in which, in the first filter, they screened for shape and chemical

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Article

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EMBO Molecular Medicine

Targeting the pregnane X receptor using microbial metabolite mimicry

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Abstract

The human PXR (pregnane X receptor), a master regulator of drug metabolism, has essential roles in intestinal homeostasis and abrogating inflammation. Existing PXR ligands have substantial off-target toxicity. Based on prior work that established microbial (indole) metabolites as PXR ligands, we proposed microbial metabolite mimicry as a novel strategy for drug discovery that allows exploiting previously unexplored parts of chemical space. Here, we report functionalized indole derivatives as first-in-class non-cytotoxic PXR agonists as a proof of concept for microbial metabolite mimicry. The lead compound, FKK6 (Felix Kopp Kortagere 6), binds directly to PXR protein in solution, induces PXR-specific target gene expression in cells, human organoids, and mice. FKK6 significantly represses pro-inflammatory cytokine production cells and abrogates inflammation in mice expressing the human PXR gene. The development of FKK6 demonstrates for the first time that microbial metabolite mimicry is a viable strategy for drug discovery and opens the door to underexploited regions of chemical space.

Keywords drugs; microbial metabolite; mimics; pregnane X receptor; therapy

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§Correction added on 17 March 2020, after first online publication: the author name has been corrected.

Research Note

Aspects of Change Among Female Migrants: The Case of Kukis in Delhi

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Thanggoulen Kipgen[1]
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Abstract

Female migration has increased globally in the last few decades. Women no longer migrate as passive followers of husbands, family or relatives but as independent migrants, causing various changes in their socio-economic life. Drawing insights primarily from field work data, the paper examines the changing role and status of Kuki women in Delhi, India, and argues that they have moved away from their traditional domestic roles. After migration, they have occupied important positions in various organizations such as the *Sum Lom*, Prayer Cell, the Church and the Kuki *Inpi*. They now play an important role in decision-making processes in the public sphere, thereby eroding elements in the traditional patriarchal system.

Keywords

Migration and change, women's status in migration, Kuki, Delhi

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ORIGINAL ARTICLE

A Bioinformatics-based Investigation to Screen and Analyze the Bioactivity of *Piper longum* Linn. Compounds as a Ground-breaking Hostile to Antidiabetic Activity

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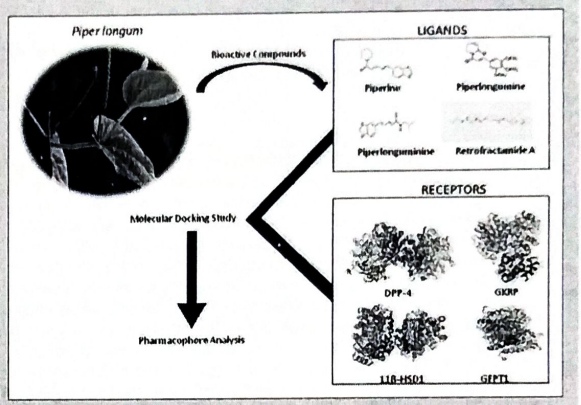
ABSTRACT

As of today, the utilization of herbal medicines has taken up the pace in treating diseases. This is due to the fact that they have lower risk of adverse reactions. Numerous plants are being used traditionally to treat various dreadful diseases including diabetes. *Piper longum* is one of the major and important medicinal plants in various systems of medicine, including the Ayurvedic system of medicine. Among the major bioactive compounds found in this plant, few compounds, viz., piperine, piperlongumine, piperlonguminine, and retrofractamide A, have been selected for studying the effectiveness on antidiabetic activity. An *in silico* approach was utilized to observe the major phytochemical properties and interaction studies of the constituents of *P. longum*, and finally, a pharmacophore investigation was carried out. In this study, we have observed the interaction of the four bioactive compounds taken from *P. longum* with the receptors via molecular docking technique. The binding of the ligands firmly with the receptors confirmed the fact that piperine, piperlongumine, piperlonguminine, and retrofractamide A act as inhibitors for dipeptidyl peptidase-4, GKRP, 11β-hydroxysteroid dehydrogenase type 1, glutamine-fructose-6-phosphate transaminase 1, and protein tyrosine phosphatase 1B, which encourage the glucose digestion and increment insulin affectability. The information acquired from this investigation might be taken further for *in vitro* examinations, which may, in the long run, be useful in recognizable proof of novel and successful particles. The outcomes acquired from this examination might provide strong understanding in the utility of phytochemicals against diabetes.

Key words: Antidiabetic, bioactive compounds, molecular docking, pharmacophore, *Piper longum*



Abbreviations used: DPP-4: Dipeptidyl peptidase inhibitor 4; GKRP: Glucokinase regulatory protein; 11β-HSD1: 11β-Hydroxysteroid dehydrogenase type 1; GFPT1: Glutamine-fructose-6-phosphate transaminase 1; PTB1B: Protein tyrosine phosphatase 1B.

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INTRODUCTION

Piper longum Linn., additionally called as long pepper, is one of the regular culinary herbs, which has been widely utilized as a constituent in different indigenous drugs. This long pepper has bioavailability upgrading action for some dietary substances and a few medications.[1] The pharmacological properties of this plant additionally incorporate the antioxidant, mitigating, hostile to hyperlipidemic, against corpulence and hepatoprotective.[2] Piperine, an alkaloid from *Piper nigrum* and *P. longum*, is a known inhibitor of different proteins in charge of biotransformation of medications. By restraining the digestion of medications, piperine improves the bioavailability of medications[3] which are hostile to diabetic action of the roots as likewise has been reported. Piperine in the blend with a sub-remedial portion of metformin has been reported for lowering blood glucose levels when contrasted with control gathering and furthermore demonstrated the more prominent bringing down of blood glucose[4] by other compounds alone or in a combination of piperine, piperlongumine, piperlonguminine, and retrofractamide A are recognized in *P. longum*. The detailed pharmacological exercises of piperlongumine incorporate cytotoxic, genotoxic, tumor enhancement, anti-angiogenic, anti-metastatic, anti-platelet conglomeration, antinociceptive, anxiolytic, energizer, prone to atherosclerotic, antidiabetic, antibacterial, hostile to contagious, leishmanicidal, trypanocidal, and schistosomicidal exercises.[5] Piperlonguminine and retrofractamide A which essentially expanded the measure of adiponectin discharged

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Precursor- induced bioaccumulation of secondary metabolites and antioxidant activity in suspension cultures of *Dendrobium fimbriatum*, an orchid of therapeutic importance

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ABSTRACT

Orchids are important sources of various bioactive molecules of medicinal importance. *Dendrobium fimbriatum* figures prominently among the various medicinal orchids used on a global scale in herbal preparations. It is an important constituent of the "Herba Dendrobii" and is widely used in Traditional Chinese Medicine (TCM). Being a highly valued herb facing the risk of extinction, use of precursors in cell suspension cultures offers valuable alternative to cater to its large-scale demand. The present research focuses on a wide scale application of various precursor molecules to upscale the production of secondary metabolites under controlled *in vitro* conditions so as to minimize the pressures exerted on its natural populations for collection. The cultures of *D. fimbriatum* inoculated with caffeic acid (CA) in the medium exhibited the highest amount of total phenolic content (50.73 mg GAE/gm DW at 0.5 mM CA) and flavonoid content (5.73 mg QE/gm DW at 1.0 mM CA). However, highest amount of tannin content (14.77 mg TAE/gm DW) was recorded in the cultures treated with p-coumaric acid at 4.0 mM in the medium. Also, cultures treated with ferulic acid at 2.0 mM in the medium resulted in the accumulation of a higher content of total alkaloids (317.82 mg ATP/gm DW). Simultaneously, the antioxidant activity of the precursor - treated cultures of *D. fimbriatum* measured by DPPH and FRAP assay revealed that the antioxidant activity was highest in the cultures treated with 0.5 mM caffeic acid which could be attributed to the increased production of total phenolic contents. The present research is significant as it reveals baseline information which if exploited scientifically can cater to an enhanced regular supply of secondary metabolites throughout the year by the use of precursors in the cultures without affecting the natural orchid populations, wherein *Dendrobium fimbriatum* is used as a model plant taxon.

1. Introduction

Medicinal plants represent important components of plant resources which are of great importance to the health of human beings. Presently, the distribution of almost all the medicinal plants is largely affected due to over-exploitation and hence most of them feature in IUCN red list (https://www.iucnredlist.org/). The potential benefits of all the medicinally important plants are largely attributed to the accumulation and biosynthesis of wide categories of secondary metabolites. Orchids are known for their multifaceted role in various traditional herbal remedies (Bhattacharyya and Van Staden, 2016). They have been documented to play an important role in diverse pharmacopeia all over the world and therefore represent potential source of various essential bioactive compounds (Bhattacharyya et al., 2019).

Dendrobium fimbriatum being one of the major constituent of the *Herba Dendrobii* warrants special acknowledgement for its various roles in hepatoprotection, nephroprotection, immunomodulatory and setting of ruptured bones (Ng et al., 2012; Shailajan et al., 2015). These medicinal attributes are primarily due to a large number of bioactive molecules that are reported to be present in *D. fimbriatum* (Bi et al., 2003; Paul et al., 2017). The protocorm-like bodies (PLBs) produced during *in vitro* culture of orchids are reported to serve as an important store house of a wide range of secondary metabolites which are useful for therapeutic properties (Martin and Madassery, 2006). In order to scale up the industrial demand, strategies to enhance the continuous production of secondary metabolites have to be formulated. Suspension cultures have evolved as one of the extensively used plant tissue culture techniques for controlled production of phytochemicals in recent years. Efforts have been localized to confine the biosynthetic products in cultures by optimizing growth conditions, selection of superior genotypes, treatment with precursors and so on (DiCosmo and Misawa,1995; Hussain et al., 2012). There is

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India's low temperature thermal desalination technology: Water diplomacy with Small Island Developing States in the Indo-Pacific Region

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ABSTRACT

Water scarcity is a long-standing issue among Small Island Developing States (SIDS). The issue is further magnified by climate change and is emerging as an existential threat to SIDS. Ironically, these states are among the lowest contributors to greenhouse gas emissions which is the primary cause for climate change. Due to limited indigenous economic and technological capacity and capability, SIDS often require external assistance. In this context, this article explores the opportunity for India to offer its Low Temperature Thermal Desalination (LTTD) technology to tackle water scarcity in SIDS. The article will assess the advantages of LTTD over conventional options such as membrane-based and other distillation-based techniques. By promoting the technology through bilateral and multilateral mechanisms, India can reinforce its position as a major stakeholder in the Indo-Pacific and as a responsible actor committed to combating and mitigating effects of climate change.

KEYWORDS: Climate Change | water scarcity | water diplomacy | desalination | Indo-Pacific | small island developing states | climate change adaptation | soft power diplomacy | climate action | clean energy | desalination | low temperature thermal desalination | OTEC | ocean thermal energy conversion | LTTD

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Original Article

Decomposing the Gaps in Access to LPG across Socio-Religious Groups in Rural India

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Abstract

This article investigates the patterns of household cooking fuel choice and its determining factors for various socio-religious groups in rural India using NSS 68th Consumption Expenditure round. The article also studies how the inter-household gaps result in many levels of Liquefied Petroleum Gas (LPG) access for households belonging to various socio-religious groups. In this regard, the application of a logistic model for the considered socio-religious groups highlights the importance of income and the education level of different members of the households. Further, the differences in the probability of access to LPG among various socio-religious groups, with respect to upper caste Hindus, are decomposed using Fairlie decomposition method. The gap in income determines a major proportion of the gap, followed by the education level of the members. We also find that the Scheduled Tribes (STs) face the problem of availability of LPG, while other socio-religious groups, when compared to upper caste Hindus, either face affordability issues or possess a taste for traditional fuel.

Keywords

LPG, free firewood, caste discrimination, development

Introduction

The emphasis on the provision of clean cooking fuels has grown due to their ability to convey (and thereby improve) 'triple dividends'—health conditions

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DIVERSE REPRODUCTIVE MODES OF SOME ANURANS IN A TEMPORARY HABITAT IN THE SOUTHERN SLOPES OF MEGHALAYA, NORTH EAST INDIA

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ABSTRACT

Among vertebrates, anurans have the most diverse reproductive modes.The high levels of rainfall and consequent relative humidity in Mawsynram, a region in the Northern ranges of the Southern slopes of Meghalaya support diverse reproductive modes of anurans. In the present investigation, diversity of reproductive modes of anurans from a breeding habitat at Mawsynramhas have been recorded. Environmental variables including rainfall, relative humidity, air and water temperature of selected breeding habitats of anurans have been recorded during the year 2018 and 2019. The study revealed seven reproductive modes among eight anuran species belonging to four families. Members of the family, Rhacophoridae demonstrate the greatest number of reproductive modes adapted to a terrestrial life by constructing foam nest. However, a newly recognized reproductive mode from the area of study is revealed by the rhacophorid *Kurixalus naso* which oviposit eggs in the soil surface and burrows without foam formation. Other anuran species belonging to families, Bufonidae, Hylidae and Dicroglossidae showed a common reproductive mode in lentic habitat. High levels of rainfall, relative humidity and optimal range of temperature of the select breeding habitats may help to sustain more reproductive modes of anurans than the drier sites.

Key words: Anurans, Reproductive modes, Breeding habitat, Meghalaya

INTRODUCTION

Anurans breed in diverse habitats such as temporary rain-fed ponds, permanent ponds, cemented tanks, streams and rivers. In addition, they prefer those sites that have vegetation cover, that provides shelter and calling sites. Anurans have the highest diversity of reproductive modes among all vertebrate taxa (Duellman and Trueb, 1986). The classification of reproductive modes in anurans is based on the oviposition site, egg characteristics, rate and duration of development, stage and size of hatchling and type of parental care (Salthe and Duellman, 1973; Toledo et al., 2012). The diversity of reproductive modes from different areas varies according to altitudinal and climatic factors (Vasconselos et al., 2010). Availability of water at the breeding site strongly determines the level of diversification of the reproductive strategies of amphibians (Duelman and Trueb, 1986; McDiarmid, 1994; Vences and Kohler, 2008). A breeding habitat with high precipitation throughout the year supports more number of anuran reproductive modes than those sites with low precipitation and seasonal climates, where only species with specialized reproductive modes can thrive in such habitats to resist desiccation (Rodrigues da Silva et al., 2012).

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Design and Development of High Voltage Power Supply and its Application in RPC

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ABSTRACT: This paper describes the design and construction of a suitable high voltage power supply to operate Resistive Plate counter (RPC). RPC is a gaseous detector in the domain of nuclear physics, two types of multiplication occurs, avalanche and streamer mode in its operation. The induced charges generated is captured from the pickup strips as a pulse with the help of front end electronics and sophisticated instruments.High voltage power supply is important to operate RPC. There are various methods to generate high voltage power supply circuit. Flyback converter is found as an optimum method which can improve the design of the circuit to make it smaller in size, simpler, cost effective and gives good results in RPC experiment. In this paper, the hardware of the HV power supply circuit and its use in measuring the detector cathode current and efficiency is explained.

KEY WORDS: High Voltage, Power Supply, Detector cathode current, Efficiency

I. INTRODUCTION

It is evident that high voltage with low power supply is needed in communication, biomedical equipment,nuclear instrumentation, high voltage testing and any other field are in high demand .The aims of this paper is to design a high voltage low power supply circuit that can produce high voltage up to 7.5 KV with lowest current and power values. This Power supply circuit is designed using flyback converter topology and high frequency transformer which is small in size, simple, low cost and locally available materials.Generated high DC voltages is applied in research work in the domain of pure and applied physics detector like RPC[1,2]. Sometimes, high direct voltages are required for insulation tests on cables, Capacitors and in impulsegenerator charging units. Many methods are found to generate high voltage dc source, while Flybackconverter is found to be suitable for proper operation of RPC due to small size and low cost.

II. FLYBACK CONVERTER

Flyback topology is the most attractive topology on account of its relative simplicity and low cost when compared with other topologies used in high voltage circuit design. It is used in both AC/DC and DC/DC conversion with galvanic isolation between input and output. PWM switching technique has been utilized for its high power capability, fast transient response and in switch mode power supply used in industry [3]. Using this approach, PWM DC-DC power converter has been used to increase the power density and actual efficiency. The advantage of Fly-back power converter is to isolate the switching control section and the output section.

III. METHODOLOGY

The design of the complete circuit is investigated in details and accumulate all the components before combine all the parts together which gives a complete working design.Initially, with the help of rectifier circuit 12V DC is generated which is applied to the driver. The driver which is the 555 timer chip will generate square wave pulse or also known as PWM to increase the frequency until thousands of Hertz. Next the PWM produced will be amplified and controlled the switching on and off by using transistor. The on and off mechanism is applied to input of the Flyback transformer [4]. Flyback transformer increases the voltage to produce the desired output high voltage according to the input frequency applied. The design of the complete circuit assembly is depicted in the following block diagram.

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Book Review

India's quest for energy through oil and natural gas: Trade and investment, geopolitics, and security

by Sanjay Kumar Pradhan, Singapore, Springer Nature, 2020, 236 pages, Rs 4,596 (eBook), eISBN: 978-981-15-5220-5

Oliver Nelson Gonsalves

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MARITIME AFFAIRS: JOURNAL OF THE NATIONAL MARITIME FOUNDATION OF INDIA

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BOOK REVIEW

India's quest for energy through oil and natural gas: Trade and investment, geopolitics, and security, by Sanjay Kumar Pradhan, Singapore, Springer Nature 2020, 236 pages, Rs 4,596 (eBook), eISBN: 978-981-15-5220-5

The emergence of India in the early 2000s as a major player in determining global energy flows has been studied with fascination by experts from, but not restricted to, several fields, such as public policy, environment, engineering, environment, and climate change. The book, India's Quest for Energy through Oil and Natural Gas: Trade and Investment, Geopolitics, and Security, by Sanjay Kumar Pradhan, an Assistant Professor of International Relations (IR) at the School of Liberal Studies, Pandit Deendayal Petroleum University, Gandhinagar, India, is a qualitative study of India's crude oil and natural gas related concerns and the strategies which have evolved to address "energy insecurity".

The book is rooted in the neo-liberal argument that socio-economic priorities have replaced the military priorities of the preceding centuries and cooperation has come to dominate international politics instead of continued strife. It contextualises this to the Indian scenario by alluding to former President A.P.J. Abdul Kalam's statement that "The quest for energy security in India is the second only to the scheme of things after food security" (p. 26). Across its 10 chapters, comprising regional and sub-regional assessments of eight existing and potential sources of India's crude oil and natural gas supply, the book outlines India's efforts to counter geopolitical and security threats through economic investments

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Research Paper

In vitro Culture of *Myrica esculenta* Buch.– Ham. ex D. Don Embryo from the Hilly Terrain of Meghalaya, North East India

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ABSTRACT

A medicinal plant *Myrica esculenta* belonging to the family Myricaceae is utilized traditionally by the local medical practitioners in North East India for treatment of several ailments. The present investigation was undertaken to assess the suitability of different nutrient media and growth regulators for improving the propagation of *Myrica esculenta* zygotic embryos *in vitro*. The zygotic embryos were cultured in three different media namely, Murashige and Skoog (MS), B5 and Woody Pant Medium (WPM) in combination with three plant growth regulators to test their effect on callus formation and regeneration. Obtained results revealed that the cultured embryos of *M. esculenta* germinated only in MS medium and not in B5 and WPM media. MS media when combined with 20 µM BAP and 10 µM NAA showed maximum percentage of germination for the explant, followed by those when combined with 10 µM BAP and 20 µM NAA and the least response was represented by those cultured in 20 µM BAP with 30 µM NAA. The formed seedlings were acclimatized in sterile vermiculite: garden soil (1:1) and later shifted to field conditions. This technique can be utilized for multiplication and may help to promote conservation strategies of the species.

Key words: *Myrica esculenta*, Zygotic embryos, Culture media, Growth regulators

Meghalaya lies in the Indo- Myanmar biodiversity hotspot harbors rich floral diversity. *Myrica esculenta* Buch.– Ham. ex D. Don belonging to the family Myricaceae, commonly known as "Kaphal", is also confined to this region [1]. This wild edible fruit species is a woody, evergreen, dioecious tree, medium to large in size. Like many other medicinal plants, different parts of *Myrica esculenta* is utilized traditionally by the local medical practitioners particularly for ailments such as dysentery, fever, diarrhoea, asthma, bronchitis, lung infections and skin diseases [2-3].

Myrica esculenta shows great variability among different populations owing to self-incompatibility of the species thus leaving outcrossing the only way to propagate this species. In addition, the impermeable nature of seed coats results in unpredictable germination. As vegetative propagation does not produce any progenies, micropropagation is the only technique to produce clones of the species [4]. An estimated quantity of 2,554 kg raw drug of *Myrica esculenta* is being consumed through folk healers in Meghalaya annually. However, lack of focus on sustainability and overexploitation of *Myrica esculenta* in the region poses a serious threat to its regeneration [5-7].

The clonal propagation technique of zygotic embryo culture is based on the totipotent nature of plant cells. This results in the development and regeneration of whole plants which eventually leads to its multiplication [8]. The relevance of this technique for micropropagation is in overcoming seed dormancy [9]. Available existing literatures revealed that no attempt has been made so far to develop a technique for the *in vitro* propagation of *Myrica esculenta* in the state of Meghalaya, North East India. Therefore, the present investigation was undertaken to assess the suitability of different nutrient media, and growth regulators for improving the propagation of *Myrica esculenta* zygotic embryos *in vitro*.

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MATERIALS AND METHODS

Myrica esculenta fruits were collected from Sohryngkham, Meghalaya, North East India (Altitude: 1609.6 m asl; Longitude: 91° 57' 27.3996" E; Latitude: 25° 32' 41.1000" N; recorded using Garmin etrex GPS). The fruits were stored in plastic containers and maintained at 4°C. Fruits were then soaked in 70% ethanol for half an hour followed by removal of the pulp. Further, the seeds were soaked in fresh 70% ethanol from which the zygotic embryos which served as explants were aseptically removed. Three tested media namely, Murashige and Skoog (MS), B5 and Woody Pant Medium (WPM) were utilized for assessment in the present investigation. Each medium contained 3% sucrose (W/V) and gelled with 0.8% agar (Himedia, India). Three plant growth regulators namely, 6-benzyl aminopurine (BAP), Naphthalene acetic acid (NAA), meta-Topolin were added to test their effect on callus formation and regeneration. All plant growth regulators were added to the respective media and the pH was adjusted to 5.8 prior to autoclaving at 1.06 kg cm^2 and 121°C for 15 min.

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Diversity of cultivable actinobacteria in Nongkhyllem Wildlife Sanctuary, Meghalaya, and their antimicrobial and plant growth promoting potentials

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The diversity of actinobacteria in soil samples collected from a protected Nongkhyllem Wildlife Sanctuary, Meghalaya was studied using a culture-based approach and assessed their plant growth promoting and antimicrobial potentialities.Different sample pretreatment methods and selective media were used for isolation. The recovered isolates were characterized using morphological, biochemical, chemotaxonomic methods, amplified ribosomal DNA restriction analysis (ARDRA) profiling, and 16S rRNA gene sequence analysis. The isolates were screened for antimicrobial activity by agar well diffusion assay against Gram-negative, Gram-positive, and candidal strains. Presence of biosynthetic gene clusters related to the synthesis of antimicrobial compounds viz. PKS-I, PKS-II, and NRPS were also screened.Plant growth-promoting traits viz. indole-3-acetic acid and siderophore production, phosphate solubilization, growth in the nitrogen-free medium were also studied. Eighty-two (82) percent of the isolates were grouped into 24 phylotypes based on *Rsa*I restriction fragment profile, and they belonged to seven genera viz. *Streptomyces*, *Nonomuraea*, *Nocardia*, *Actinomadura*, *Kribbella*, *Streptosporangium*, and *Amycolatopsis* based on 16S rRNA gene sequence analysis. The diversity indices revealed low generic diversity due to dominance by *Streptomyces*(77%), and there were indications of rich species diversity based on ARDRA phylotypes and 16S rRNA gene sequence analysis.Few streptomycetestrains expressed antimicrobial activity against Gram-positive and candidal strains. Three strains PF-22, PF-31, and PF-48 exhibited broad-spectrum antimicrobial activity; 61% of the isolates were found to have the genetic potential to produce antimicrobial metabolites, but only 5% exhibited bioactivity, probably due to inappropriate screening and culture conditions. Several streptomycete strains showed plant growth-promoting traits and antagonistic activity against potential phytopathogens.The tropical forest soil of the study site in Meghalaya harbours potentially diverse actinobacterial species, with genetic potential for producing antimicrobial metabolites and plant growth promotion.

Key words: Pristine forest soil; actinobacteria diversity; antimicrobial activity; plant growth promotion

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SHORT COMMUNICATION

Gene-to-trait knowledge graphs show association of plant photoreceptors with physiological and developmental processes that can confer agronomic benefits

Hame Bantei Mawkhiew · Lingaraj Sahoo · Eros V. Kharshiing

Received: 16 February 2021 / Accepted: 9 May 2021

Abstract Global population growth, climate change, altered precipitation rates and cropping patterns are increasingly challenging plant scientists to improve crop productivity for food and non-food applications. Hence, there is a pressing need for identifying candidate genes that can be targeted for breeding future crops having enhanced agronomic benefits. Network mapping utilises available data and creates knowledge graphs that aid in visualising association(s) between the individual data items. Here, we have generated gene-to-trait knowledge graphs of known plant photoreceptors using the KnetMiner gene discovery platform which generates biological networks from literature/data sets available in public databases. The resulting knowledge graphs indicate a close association of photoreceptors with various physiological and developmental processes such as shoot architecture, yield, disease resistance and water use efficiency among others, that can confer agronomically important benefits. Such information can be of assistance to plant biologists in the selection of potential gene targets for improving agronomically beneficial traits in plants. This report highlights the potential of machine learning and knowledge graphs as aids in more efficient knowledge discovery and novel decision-making processes which can also be employed for crop breeding or crop engineering.

Keywords Crop physiology · Gene discovery · Knowledge graphs · Molecular breeding · Photoreceptors · Plant development

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Introduction

Climate change will inevitably alter plant developmental patterns which could subsequently impact plant growth and productivity in natural environments. Recent reports have suggested that the impact of climate change has already resulted in a likely reduction of approximately 1 % of the average consumable food calories in major crops (Ray et al. 2019). How plants regulate their developmental plasticity in response to changes in climatic conditions such as increased temperatures, altered precipitation rates and increased frequency of extreme climatic events will be critical to agricultural productivity for meeting the needs of the rising global population. To meet this challenge, there is a need to breed or engineer crop varieties that have better adaptability to their growing environment resulting in improved yields. A better understanding of the various

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MENTAL HEALTH PROBLEMS AMONG SCHOOL GOING ADOLESCENTS IN INDIA: A LITERATURE REVIEW

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ABSTRACT

School going adolescents are in a transition period that bridges childhood and adulthood, during which major physical, cognitive, and psychological changes occur. Today's youngadolescents deal with issues related to suicide; and many other social, emotional, physical and psychological issues. These internal stresses and social expectations lead to moments of ambiguity, self-doubts and disappointment in the adolescents. It is in these situations that the young person takes risks and involves in risk taking behaviors. The present review is focused on mental health problems of school going adolescents in India based on pertinent studies from different online search engines, journals and articles of the past years.The reviews illustrationthe high and increasing prevalence of Mental Health problems among school going adolescents and the need for school based Mental Health services in every school in the country.

KEY WORDS: ***School-going, adolescent, Mental Health, problems, Review, India.***

INTRODUCTION

Indian youth represent a significant proportion of the worldwide population. As per census 2011, youth (15-24 years) in India constitute one-fifth (19.1%) of India's total population. India is expected to have 34.33% share of youth in total population by 2020[1]. Mental health is one of the most important aspects of development among school going adolescents yet the most neglected. India, a developing country needs much improvement of its mental health care services, especially among school going adolescents.

MENTAL HEALTH PROBLEMS AMONG SCHOOL GOING ADOLESCENTS IN INDIA

The review is based on the secondary data from online resources such as PubMed, Google scholar, Psych- info journals. Several studies from the past 10 years were reviewed based on the Mental Health aspects of school going adolescents and terms like Health and Mental health problems, prevalence, challenges, psychosocial, behavioral and emotional problems, suicide, psychiatric disorders were used in the search engine. The following are the major findings found from the review.

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ECOTOURISM AND RURAL LIVELIHOOD OPPORTUNITIES IN EAST KHASI HILLS DISTRICT, MEGHALAYA

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ABSTRACT

Meghalaya is one of the states in North-east India that is blessed with beautiful and mesmerising natural scenic beauty. The undulating green hills, pleasant breeze, waterfalls gushing from the mountains, complimented with cool climatic condition is the best combination for nature loving tourists to experience. This paper identifies the livelihood opportunities that ecotourism has provided to the local communities. Three villages i.e., Mawlynnong, Riwai and Mawsmai has been selected for the study. Purposive Sampling was adopted to identify households engaged in ecotourism activities. Primary data was collected from the households that are engaged generating livelihood from Ecotourism related activities. There are a wide range of ecotourism related activities that are being engaged by the local community members to generate income. There are also livelihood activities engaged by the respondents that has a scope for providing employment for other community members as well. In the context of the three villages selected, ecotourism has served as both primary and also secondary sources of income for the local communities, it is evident that ecotourism has played a major role in promoting livelihood and village economy in the three villages. Ecotourism has the potential for the enhancement of rural livelihood through more innovative, sustainable and eco-friendly practices.

INTRODUCTION

There are a variety of ecotourism definitions such as nature travel, nature-orientated tourism, nature tourism, nature–based tourism, sustainable tourism, alternative tourism and special interest tourism (Laarman & Durst, 1987; Durst & Ingram, 1988; Wilson & Laarman, 1988; Valentine, 1992; Hall & Weiler, 1992; Diamantis, 1998a). According to the TIES (2006), ecotourism is another segment of the tourism industry that focuses on exploring the untouched and remains of natural areas (I Nee & I Beckmann, 2011).

Mass tourism was the common form of tourism practiced in the initial development stage of tourism. It was also expected that this would also bring about growth in the economy in forms of foreign exchange and GNP growth, tax revenue and employment (Lascurain, 1996); however, it had led to various problems and effects like environmental, economic and socio-cultural degradation. Due to the development of mass tourism, much of the funds and subsidies are being allocated to tourism industry that favours tourists and leaving the other programmes and industries that are benefitting the locals. According to Brown in O'Neil (2002), during the 1980s, many argued that there was a need for another alternative to tourism as it has negative impact on the environmental, economic and socio-cultural aspects of the host communities. A call for 'alternative tourism' was highly demanded on the basis that its policies should not only consider economic growth but also environmental quality and welfare of the local people.

This gave rise to the environmental movement which demanded from the government to specially allocate separate land for animals and the ecosystem and as an opportunity for people to visit and admire the

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The First Comprehensive Description of the Normal Development of Annandale's High Altitude Frog, *Kurixalus naso* (Annandale, 1912)

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Abstract: The discrimination of developmental stages of anurans is of critical importance in understanding the morphological characteristics of each specific stage of tadpoles. Unlike most rhacophorids which construct foam nest during **egg deposition, *Kurixalus naso* shows no foam formation during oviposition. This rhacophorid displays a unique oviposition whereby the eggs are laid in the** moist soil under burrows and mixed with the loose top layer of the soil giving **loose eggs a seed-like appearance. The present study highlighted and documented the developmental stages of *Kurixalus naso* until complete** metamorphosis. A normal developmental table consisting of 46 developmental stages was proposed for *Kurixalus naso*. Stages of development and **metamorphosis of *Kurixalus naso* were divided into 11 major developmental terms, each consisting of a number of successive stages: fertilization (stages 1–2), cleavage-blastula (stages 3–9), gastrula (stages 10–12), neurula (stages 13–16), tail bud stages (stages 17–20), external gill stages (stages 21–22), operculum and oral disc stages (stages 23–25), hind limb bud formation (stages 26–30), toe differentiation and development (stages 31–39), well-developed** hind limb (stages 40–41) and metamorphosis (stages 42–46). The embryos of **this species hatched into a free-swimming tadpole at stage 25. *Kurixalus naso* completed the entire process of development and metamorphosis over 62 days.** This investigation may contribute to future studies on evaluation of adaptive **characters, comparative embryology, and other developmental studies, associated with phylogenetic inferences.**

Key words: Anuran amphibians; Developmental stages; Eggs; *Kurixalus naso*; Metamorphosis

INTRODUCTION

Anurans breed in diverse habitats, and most of them display a complex biphasic life cycle with aquatic larva and terrestrial adults

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Cross-sectional Study on Prevalence of Betel Nut Chewing among the Youth of Meghalaya, North East Region of India: Development of Multifaceted Prevention Strategy

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Abstract

Introduction: Betel (Areca) nut intake, one of the most common oral chewing habits in the world, has been linked to the development of oral cancer, with India having an alarming situation with the highest number of registered oral cancer cases in the world. **Method:** A cross-sectional analysis was done among the young population of Meghalaya in the North Eastern Region of India, where this habit is prevalent. A questionnaire for on-ground data collection was administered to a total of n = 315 participants of both sexes from institutions in and near Shillong, Meghalaya. The relationship of this habit with social structure, knowledge, attitude, and risk perception was done. **Result:** A high prevalence rate of 78.09% was found among the school and undergraduate students from Shillong urban and adjoining rural areas for betel nut (BN) chewing with a higher female to male BN chewing ratio. This habit usually starts at the school level and persists for life. Peer pressure, lack of awareness, habituated families, and strong cultural linkage encourage children and adolescents to start chewing BN at an age as early as of 10 years. Lack of adequate awareness programs highlighting the ill-effects of BN and associated masticatory substances adds to the problem. **Conclusion:** Strategic, structured region-specific, multifaceted awareness programs highlighting the potential health risks from uncontrolled, habitual usage of Areca nut has been proposed to prevent initiation of this habit.

Keywords: Areca nut, Betel nut, Betel quid, North-East India, Oral cancer
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Introduction

Areca nut (AN) or Betel nut (BN), the seed of *Areca catechu* Linn is one of the most unhealthy substance used after nicotine, alcohol and caffeine in the world. More than half of its global consumption has been recorded in the Pacific island and South Asian countries. BN is primarily composed of proteins, fats, carbohydrates, crude fibers, polyphenols, mineral matter, and alkaloids. The alkaloids including arecoline have adverse effects on the nervous and cardiovascular systems, generating a sense of euphoria and relaxation to the user. BN is chewed slowly, paving way for the persistent exposure and sustained absorption of its alkaloids in the oral cavity. It increases salivation and is used to tolerate long gaps between the meals, relieving toothaches and to boost digestive system. The addictive practice of BN has an etiological correlation with the susceptibility to oral cavity cancers, one of the major causes of mortality in India and worldwide. According to the International Agency for Research on Cancer, BN is Group 1 Carcinogen, increases risk of oral, liver, biliary tracts, uterus, esophagus, and pharynx cancers. BN chewing causes malignant lesions such as oral mucosal fibrosis leading to oral cancers. Often, BN chewers combine BN chewing with smoking cigarette which harms the cardiovascular and respiratory system increasing the risk of developing oral leukoplakia and submucosal fibrosis.

In the simplest form, BN is chewed wrapped in betel leaf with slaked lime; this preparation is called betel quid (BQ). BN is also consumed alone in its dried or nut form and in packaged chewing products such as "gutka" and "paan masala". In India, BN consumption is mostly confined to the North Eastern Region (NER), coastal areas, and some parts of northern plains. It is called tamul or kwai in NER and paan in north India. In NER, India including Khasi region of Meghalaya, BN and its derivatives are socially endorsed widely used masticatory products. A large number of people chew BN due to their tradition, easy availability, and regional backdrop. Poor people in these areas eat BN with betel leaf to stave off their hunger pangs.

BN chewing habit among school children is becoming common in developing countries like India. The initiation of this habit at a very early age is a matter of serious concern requiring an urgent need to intervene and prevents them from becoming addicted. Areca products in the packed form commonly available attracts usage by young community. Studies assessing the prevalence BN habit among school children have been reported from different regions. A prevalence rate of 27.06% for AN chewing in Indore (Madhya Pradesh, India) school students has

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Estrogen-related receptor alpha in select host functions and cancer: new frontiers

Harmit S. Ranhotra

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Abstract

Eukaryotic gene expression is under the tight control of transcription factors, which includes the estrogen-related receptor alpha (ERRα). The endogenous ligand(s) acting as ERRα agonist has not been identified and confirmed. ERRα is a prominent member of the nuclear receptors super-family with major roles in energy metabolism, including immunity, cell growth, proliferation and differentiation and a host of other functions in animals. The actions exerted by ERRα towards gene expression regulation are often in association with other transcriptional factors, receptors and signal mediators. Metabolic regulation by ERRα is known for some time that has tremendous impact on host biology like autophagy, angiogenesis, mitochondrial activity, including lipid metabolism. Cellular metabolism and cancer has intricate relationship. On account of the participation of ERRα in metabolism, it has been implicated in various types of cancer onset and progression. In a number of findings, ERRα has been demonstrated to influence several types of cancers, exhibiting as a negative prognostic marker for many. Such diverse role associated with ERRα is due to its interaction with numerous transcriptional factors and other signalling pathways that culminate in providing optimal gene regulation. These observations points to the crucial regulatory roles of ERRα in health and disease. In this article, some of the new findings on the influence of ERRα in host metabolism and biology including cancer, shall be reviewed that will provide a concise understanding of this receptor.

Data availability

Enquiries about data availability should be directed to the authors.

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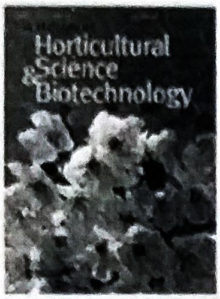

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Manipulation of light environment for optimising photoreceptor activity towards enhancing plant traits of agronomic and horticultural importance in crops

Eros V. Kharshiing, Ophilia Ibapalei Lyngdoh Mawphlang, Vardhana Lama, Ramyani Bhattacharjee & Lingaraj Sahoo

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Understanding the Relationship between CSR and Dividend Policy: Review and Future Prospects

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Abstract: The study explores and highlights the relationship between dividend payout (DP) policy and corporate social responsibility (CSR). For this purpose, the author used a survey method to find previous research articles that have discussed this relationship. The study's findings suggest that CSR and DP, individually and with other variables, have been considerably researched. However, when it comes to the relationship between the two variables, the research is only about a decade old. Thus, minimal research has explored this relationship and has concentrated only on developed economies. Most of these researchers have found a positive relationship between the two variables, despite taking different proxies to measure CSR, which is contrary to the Resource-Based Theory. The author concluded that there is a lack of research focusing on the relationship between the two major corporate decisions. Thus, no theory(ies) explains the relationship, and corporate managers, policymakers, investors, and even researchers have not paid enough attention to the association and its implications.

Keywords: corporate social responsibility, dividend payout, resource-based theory, value creation.

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INTRODUCTION

For many years, corporate firms have been using Dividend pay-out policies (DP) and Corporate Social Responsibility (CSR) activities to improve their reputation. The dividend pay-out policy and CSR activities also help firms attain a competitive edge and better their financial performance (FP), which is reflected through an increase in the firm's overall value. The concept and construct of Dividend pay-outs have remained more or less the same. On the other hand, the concept and construct of CSR have undergone tremendous change, especially in the past few decades. This change can be attributed to the different approaches taken by the corporates concerning CSR activities (Robinson et al., 2011).

Research on CSR has focused on its relationship with Corporate Financial Performance (CFP) (Ronald et al., 2019) and how CSR is associated with creating wealth (Hasan & Yun, 2017). Most of this research studying the relationship between CSR with CFP or wealth creation has concluded that CSR positively affects both (Orlitzky et al., 2003; Walsh et al., 2003). Lately, researchers have shifted their focus on several other themes in corporate finance and its relationship with CSR, such as – 1) information asymmetry (Dhaliwal et al., 2011),

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Die Fortpflanzungszeit beginnt erst im April und dauert bis Juli, wenn die Lufttemperatur zwischen 14,5 und 25 °C, die relative Luftfeuchtigkeit zwischen 59 und 85 % und die Niederschlagsmenge zwischen 71 und 603 mm schwankt (Tabelle 1 und Abb. 7). Die Paarungsaktivität von *P. himalayensis* erreicht im Mai ihren Höhepunkt und nimmt gegen Ende Juli ab. Von August bis Februar wurde keine Paarungsaktivität beobachtet, wobei die Lufttemperatur, die relative Luftfeuchtigkeit und die Niederschlagsmenge zwischen 6,1 und 24,5 °C, 52 und 93 % bzw. 0 und 429 mm schwankten. Die adulten Frösche überwinterten in Baumhöhlen, in der Laubstreu des Waldes oder unter Felsen und Steinen.

Bei der vorliegenden Untersuchung handelt es sich um die erste umfassende Studie zur Erfassung und Beobachtung der Fortpflanzungsaktivitäten von *P. himalayensis* in seinem natürlichen Lebensraum. Die Studie zeigt, dass die Paarungsaktivität stark vom Einsetzen der ersten Regenschauer beeinflusst wird. Die Interaktion zwischen klimaspezifischen physikalischen Faktoren ist wichtig für die Initiierung von Paarungsaktivitäten bei Anuren (Willaert et al. 2016). In den Tropen ist der Niederschlag der primäre extrinsische Faktor, der die Fortpflanzungsaktivität von Anuren vermittelt (Crump 1974; Aichinger 1987; Donelly & Guyer 1994; Neckel-Oliveira et al. 2000). Dies zeigt sich auch in der vorliegenden Studie, da die Fortpflanzungsaktivität von *P. himalayensis* nach den ersten Regenschauern in der Vormonsunzeit einsetzt. Regen löst nicht nur die Fortpflanzungsaktivität von *P. himalayensis* aus, sondern mit dem Einsetzen des Monsuns werden auch die Ablageplätze mit Regenwasser überflutet, was wahrscheinlich dazu beiträgt, die geschlüpften Larven in den Teich zu spülen, wo sie ihre Entwicklung vollenden. Ähnliche Ergebnisse wurden auch von anderen Forschern berichtet (Prado et al. 2005; Wells 2007; Shangpliang et al. 2020), wonach der Regen den Transport der frisch geschlüpften Larven in den Teich ermöglicht. Der Anstieg der Umgebungstemperatur während der Fortpflanzungsperiode lässt darauf schließen, dass sie für die Einleitung der Fortpflanzungsaktivität der untersuchten Anurenarten mitentscheidend ist. Der ermittelte optimale Temperaturbereich ist wichtig für die Entwicklung und das Überleben der Art, was mit dem Bericht von Duellman & Trueb (1986) übereinstimmt. Darüber hinaus können feuchte Habitate als einschränkende ökologische Faktoren wirken, die die Aktivität, die Eientwicklung, die Wachstumsraten und die Sterblichkeit beeinflussen (Duellman & Trueb 1986; Prado et al. 2005). Die vorliegende Studie bestätigt die vorgenannten Berichte, da die festgestellte relative Luftfeuchtigkeit des Habitats relativ hoch ist und somit die Paarungsaktivitäten und die Entwicklung ungehindert ablaufen können.

Der beobachtete Bau von Schaumnestern in der Nähe des Gewässers zeigt, dass *P. himalayensis* ähnliche Fortpflanzungsstrategien wie andere Rhacophoriden, z. B. *Rhacophorus malabaricus* und *Chiromantis simus* (Kadadevaru & Kanamadi 2000; Deuti 2001), besitzt. Die Ergebnisse unserer Untersuchung zeigen, dass die von den Männchen von *P. himalayensis* ausgestoßenen Werberufe im Vergleich zu anderen Berichten der vorhandenen Literatur einzigartig sind. Daher kann man davon ausgehen, dass sie als wichtiges Diagnoseinstrument auf dem Gebiet der Taxonomie verwendet werden können, um die taxonomischen Unterschiede zwischen eng verwandten Amphibienarten zu klären.

Zusammenfassend lässt sich sagen, dass die Qualität des Ablageplatzes das Überleben, das Wachstum und den Abschluss der Entwicklung von *P. himalayensis* stark beeinflusst. Für die Diversifizierung der Fortpflanzungsstrategien der Art könnten auch andere Faktoren wie Vegetationsbedeckung, längere Wasserperioden, Wassertemperatur und pH-Wert eine entscheidende Rolle spielen. Für die Entwicklung realistischerer Erhaltungsstrategien, einschließlich der Einrichtung eines neuen Schutzgebiets, das eine große Vielfalt von Anuren umfasst, sind solche Studien nachweislich von Nutzen.

Reproductive activity and terrestrial oviposition of *Polypedates himalayensis* (Annandale, 1912) in the hilly terrain of Meghalaya, northeast India

The greatest diversity of reproductive behaviour among all vertebrate taxa is exhibited by the anurans (Duellman & Trueb 1986; Willaert et al. 2016). A variety of reproductive strategies are found among frogs of the family Rhacophoridae. Some lay their eggs in foam nests or burrows, while others exhibit direct development (Duellman & Trueb 1986). Rhacophorids, for example, build foam nests on various

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Traditional Knowledge and the Community: Mapping the History and Continuity of Traditional Medicine and Healers among the Khasi, Meghalaya.

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Abstract:
Indigenous knowledge is believed to reflect a particular environmental knowledge based in a particular place. It is rooted in the practices, know-how and the interactions in the community through oral communication and demonstrations. Hence, one can safely say that local knowledge is firmly tied to the cultural heritage of a place or a community. It is significant to locate the aspects of health, beliefs and practices relating to health and disease, diagnosis and treatment methods, healers and curers and their recruitment, concepts and organization of medical systems etc in its socio-cultural milieu. More plainly understood, the subject of health culture focuses on the nature of illness, methods and criteria of classification of disease, the causes and cures, types of therapists that seek to alleviate illness and their skills and social roles, preventive measures are all in lines of how the natives conceive these processes. The present study concentrates on the traditional healers and medicines in Shillong, Meghalaya and its continuity in contemporary Meghalaya.

Key words: Tradition, Health, Indigenous knowledge, Traditional medicine.

INTRODUCTION

One may wonder about how people viewed or how they approached any kind of illness and prior to modern society or before the coming of modern medicine and the influence of science and technology. It is believed that, traditional healers and medicine have been prevalent since the beginning of civilization. When we look into the history of traditional medicines we see that they have all been derived from their immediate environment. The term traditional healing and medicine are seen as or referred to the ways and practices that existed before the use of modern medicine in order to restore one's health. This knowledge of practice is believed to have been passed down from one generation to the next, orally and not through any written documentation or institution.

Traditional and tribal medicinesstill constitute the most important source of healing for much of the world's population, especially for those living in areas away from the urban centre.It is still practiced in all kinds of societies andembodies the use of native plants,and medicinal oils as well as using the principle of indigenous knowledge, philosophy, and spirituality. It often reflects a specific environmental knowledge and is embedded in the practices, experiences as well as exchanges in the community through oral communication and demonstrations.

Tetso (2008) points out that there is a variation in the mode of acquiring knowledge and skills and entering into ethnomedical practice unlike the entry into modern practice. He believed that one could learn informally from the elderly in the family and inherit the practice. At times one learns it out of practice. He also mentions that it could also be their belief in their God who appears in their dreams or

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Pressure-Induced Enhanced Optical Absorption in Sulvanite Compound Cu_3TaX_4 (X = S, Se, and Te): An *ab Initio* Study

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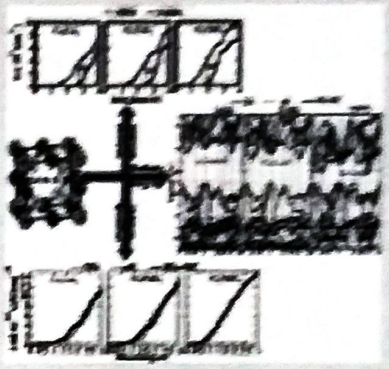
ABSTRACT: *Ab initio* study on the family of ternary copper chalcogenides Cu_3TaX_4 (X = S, Se, and Te) is performed to investigate the suitability of these compounds to applications as photovoltaic absorber materials. The density functional theory based full potential linearized augmented plane wave method (FP-LAPW method) is employed for computational purposes. The electronic structure and optical properties are determined including electron−electron interaction and spin−orbit coupling (SOC), within the generalized gradient approximation plus Hubbard U (GGA+U) and GGA+U+SOC approximation. The large optical band gaps of Cu_3TaS_4 and Cu_3TaSe_4 considered ineffective for absorber materials, and also the hole effective mass has been modulated through applied pressure. These materials show extreme resistance to external pressure, and are found to be stable up to a pressure range of 10 GPa, investigated using phonon dispersion calculations. The observed optical properties and the absorption coefficients within the visible-light spectrum make these compounds promising materials for photovoltaic applications. The calculated energy and optical band gaps are consistent with the available literature and are compared with the experimental results where available.



1. INTRODUCTION

To fight issues like global warming and climate change, a viable long-term solution is the usage of renewable sources for energy generation. The development of sustainable and environmentally friendly high-performance semiconductors is of paramount importance in this regard. It will accelerate the progress of required technology for the production of renewable and green energy sources such as solar cells and photovoltaic and thermoelectric materials.[1] One such class of semiconductors is the ternary copper chalcogenides, forming the members of the family Cu_3−M−VI A_4 (M = V, Nb, Ta; and VI A = group VI A elements, generally chalcogen atoms S, Se, or Te), known as the sulvanite group of compounds. Recent theoretical and experimental works[2−9] on sulvanite compounds report them to be indirect band gap semiconductors, exhibiting tunable photoemission properties, large optical band gaps, and excellent electro-optic properties.[3,6] The nontoxic, as well as earth-abundant elemental constituents, have attracted further attention of researchers in investigating the potential application of these compounds. They have cubic symmetry, and interestingly their band gap increases in substitutional sequence V → Nb → Ta but decreases in the sequence S → Se → Te. This ability to selectively control the band gap by varying stoichiometry provides a broad range of applications[7] and is highly potent to engineer photovoltaic materials for efficient visible-light absorption. Materials ideal for visible-light absorbers are direct band gap semiconductors such as $Cu(In/Ga)Se_2$ (CIGS), CdTe, and $Cu_2ZnSn(S/Se)_4$ (CZTSS),[8] with an energy gap in the range of 1.5 eV and with an absorption coefficient as high as $\alpha = 10^6$ cm^{-1}.[9] Although these materials have record efficiencies of 20.5%, 19.6%, and 12.6%, respectively,[8,10] the high toxicity of Cd and the rarity of In make these materials unsuitable for widespread application. Consequently, photovoltaic systems consisting of relatively abundant and environmentally amicable elements like Si, Al, Zn, Cu, S, P, and Se and fulfilling the above requirements have to be chosen. A potential emerging class of materials is perovskite hybrid halide compounds, with efficiency reaching up to 17%.[11,12] However, the stability of these organic−inorganic hybrids is an issue, and long-term as well as high temperature stability is still questionable due to the weak chemical bonding of the organic cations.[13]

Studies on indirect band gap semiconductors like Si show that photovoltaic efficiency is determined mainly by the

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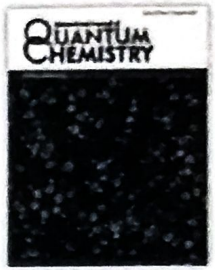

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RESEARCH ARTICLE

DFT study of structural, mechanical, thermodynamic, electronic, and thermoelectric properties of new PdTiZ (Z = Ge and Pb) half Heusler compounds

Correction(s) for this article

Dipangkar Kalita, Nihal Limbu, Mahesh Ram, Atul Saxena

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Prediction of some physical properties in new half Heusler alloy NbAgSi

Dipangkar Kalita, Mahesh Ram, Nihal Limbu, Raju Kalita, Atul Saxena

Show more

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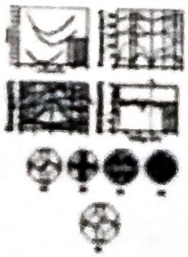
Abstract

A first principle investigation of structural, dynamical, mechanical, thermodynamic and electronic properties of 'NbAgSi' alloy was performed using the density functional theory. Among 'α', 'β', and 'γ' structural phases, ferrimagnetic 'β'-phase was found to be the most favorable ground state. The structural and dynamical stabilities of the compound were determined by the formation/cohesive energies. The dynamical stability was further strengthened by positive phonon frequencies, observed in the phonon dispersion curves. The mechanical properties of the sample material were explored using the elastic constants to explore its mechanical applications. To include the effect of highly correlated system Nb, the Hubbard parameter (U) was determined and incorporated in the calculations to predict the half-metallic behavior of the sample alloy correctly. The inclusion of the U term had a significant effect on the electronic and magnetic properties of the system. The material was found to possess anisotropic character with ductile behavior. The thermodynamic properties were also measured over the temperature range 0 – 500K under different pressures. The optical phonon modes were found to be a mixed character of Raman and infrared active. The electronic and bonding behavior were analyzed from the Fermi surface, charge density plot and electron localized function. The charge transfers between the atoms were investigated using the Bader charge technique. The results presented in the present manuscript open the possibility of the sample material as a promising candidate for spintronic applications.

Graphical abstract



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Microcystis sp. AE03 strain in Dal Lake harbors cylindrospermopsin and microcystin synthetase gene cluster

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Cyanobacterial harmful algal blooms (CHABs) are increasing at an alarming rate in different water bodies worldwide. In India, CHAB events in water bodies such as Dal Lake have been sporadically reported with no study done to characterize the cyanobacterial species and their associated toxins. We hypothesized that this Lake is contaminated with toxic cyanobacterial species with the possibility of the presence of cyanotoxin biosynthetic genes. We, therefore, used some of the molecular tools such as 16S ribosomal DNA, PCR, and phylogenetic analysis to explore cyanobacterial species and their associated toxins. A 3-year (2018–2020) survey was conducted at three different sampling sites of Dal Lake namely, Grand Palace Gath (S1), Nigeen basin (S2), and Gagribal basin (S3). Two strains of *Dolichospermum* sp. AE01 and AE02 (S3 and S1 site) and one strain of *Microcystis* sp. AE03 (S2 site) was isolated, cultured, and characterized phylogenetically by 16S ribosomal DNA sequencing. The presence of cyanotoxin genes from the isolates was evaluated by PCR of microcystins (*mcyB*), anatoxins (*anaC*), and cylindrospermopsins (*pks*) biosynthesis genes. Results revealed the presence of both *mcyB and pks gene* in *Microcystis* sp. AE03, and only *anaC* gene in *Dolichospermum* sp. AE02 strain. However, *Dolichospermum* sp. AE01 strain was not found to harbor any such genes. Our findings, for the first time, reported the coexistence of *pks* and *mcyB* in a *Microcystis* AE03 strain. This study has opened a new door to further characterize the unexplored cyanobacterial species, their associated cyanotoxin biosynthetic genes, and the intervention of high-end proteomic techniques to characterize the cyanotoxins.

KEYWORDS

Dal Lake, *Dolichospermum* sp. strain AE01, *Dolichospermum* sp. strain AE02, *Microcystis* sp. strain AE03, anatoxin-a, microcystin, cylindrospermopsin

Research article:

KF-Al_2O_3 catalyzed One-Pot Synthesis of Benzo[α]xanthene-11-ones

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Abstract: KF-Al_2O_3 as a recyclable basic catalyst for the one-pot synthesis of benzoxanthenone derivatives by the reaction of aromatic aldehydes, β-naphthol and dimedone in the presence of a catalyst in ethanol under microwave irradiation. The protocol is environmentally benign, offering access to a range of benzoxanthenone derivaties in good to excellent yields.

Keywords: *KF-Al_2O_3; Benzoxanthenone; Microwave Irradiation; Ethanol; One-pot synthesis.*

1. INTRODUCTION

Benzoxanthenones, compounds containing a xanthene skeleton are important biologically active compounds which are known to possess analgesic [1], antiviral [2], antibacterial[3] and anti-inflammatory properties [4]. These compounds have also been established as antagonists for paralyzing the action of zoxazolamine [5] and in photodynamic therapy [6]. Furthermore, these heterocyclic compounds have found applications in industries such as fluorescent dyes [7], in laser technology [8] and as pH sensitive fluorescent materials for visualization of biomolecules [9]. Their broad utility range have made these xanthene scaffolds synthetic targets, thereby, increasing the need to devise and design newer synthetic routes for exploitation of these structural moieties. Therefore, their synthesis occupies as a subject of immense interest to synthetic chemists and has achieved prominence in synthetic, organic as well as medicinal chemistry.

The general strategy to synthesize xanthenone scaffolds involves the multi-component condensation of aromatic aldehydes, β-naphthol and cyclic 1,3-dicarbonyl compounds such

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Assessment of Life skills among the adolescents residing in Child Care Institutions

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ABSTRACT
The present study is an attempt to assess the level of Life Skills among adolescents residing in Child Care Institutions (CCIs) in Meghalaya. Descriptive Survey method was implemented for the present study and a sample of 200 adolescents between the age group of 11-18 years was selected randomly using a simple random technique. The tool used for collecting the data was Life Skills Assessment Scale A. Radhakrishnan Nair, R. Subasree, and Sunitha Ranjan. It is observed from the computed data that the majority (47 per cent) of the respondents possessed a low level of life skill, and 36 per cent of the adolescents were found to possess an average level of life skills, whereas, 16 per cent of the adolescents were found to possess a very low level of life skill and one per cent of the respondents was found to possess a high level of life skills. Further significant differences have been found between male and female respondents concerning their life skills, where male adolescences were found to possess a higher level of life skills than its counterpart.

KEYWORDS: Life Skills, Adolescents, Child Care Institution

I. INTRODUCTION

[1] According to the United Nations, adolescents are individuals between the age group of 10-19 years of age and currently their world population is 1.2 billion which account to 16 per cent of the world's population. [2] More than half of the adolescent population are residing in Asia, and majority of them are in South Asia which accounts to nearly 350 million. [3] According to a document published by the Ministry of Women and Children Development (MWCD) in 2018, the Report of the Committee for Analysing Data of Mapping and Review Exercise of Child Care Institutions under the Juvenile Justice (Care and Protection of Children) Act, 2015 and Other Homes includes the mapping of 9589 CCIs in India except for 34 CCIs located in Uttar Pradesh. In the report, it is stated that there are 377,649 children living in CCIs, of which 7422 are children in conflict with law (CCL) and 370,227 are children in need of care and protection (CNCP).

[4] A "child care institution" is a home that is recognised under the Juvenile Justice (Care and Protection of Children) Act and it was established with an intention to provide care and protection for the children who are in need of it. These institutions function in such a way that all the decisions made relating to the child should be based on the fundamental principle of the best interest of the child. [3] A few of the categories of children who live in CCIs/Homes include children of single parents, orphans, abandoned, surrendered, sexually abused, victims of child pornography, children trafficked for domestic work, trafficked for labour, trafficked for commercial sexual exploitation, victims of child marriage, homeless/runaway/missing children, mentally and physically challenged children. [5] CCI adolescents are the most vulnerable group and psychosocial support is needed to promote mental health, and [6] one study found that life skills are linked to improved and enhance mental health and academic outcomes in adolescents.

[7] The World Health Organization (WHO) also suggested that promotion of health can be contributed by enhancing the psychosocial competence of an individual especially when the health issues are caused by behaviours related to the lack of ability to deal effectively with stresses and pressures in life. Psychosocial competence of children and adolescents can be enhanced by

Psychosocial Challenges of School Going Adolescents During Covid-19 Pandemic: Teachers' and Parents' Perspective

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Abstract:- The study Probe into understanding the psychosocial challenges faced by school going adolescents during covid-19 pandemic. The study is descriptive in design and makes use of Purposive sampling to identify respondents from Nongstoin, West Khasi Hills District of Meghalaya. Semi-structured Interview guide is used among Secondary school teachers and parents. Results showed that there is frustration, isolation and loneliness, uncertainty and fear, anxiety, academic stress, unfamiliar online learning for adolescents as well as for the Teachers, internet connectivity problems, poorer control over their everyday life, feeling of helplessness among the adolescents and even the teachers and parents themselves.

Keywords:- *Psychosocial Challenges, School Going Adolescents, Teachers and Parents.*

I. INTRODUCTION

The COVID-19 pandemic has wreaked havoc across the world and brought the world to a standstill with unprecedented changes in our society. The impacts of the Pandemic and the lockdown have been disruptive and changed the way in which humans perform their daily activities and go about their routine lives. Such impact has however not been the same across all social groups, with the most vulnerable and marginalized groups being affected differently.

The World Health Organization declared the Covid-19 as a pandemic in March 2020 (WHO, 2020). Since then, several countries including India introduced measures to slow down the transmission of the virus in their community. These included social distancing, identification of cases and their isolation, contact tracing and containment of high transmission zones, and personal and environmental disinfection. Countrywide lockdown is one method to bring about all the above-mentioned measures. India went into a lockdown from March 2020, with restrictions in all areas except for essential commodities and health care. Slow relaxations of the lockdown started again from May 4, 2020, with only minimal activities in the community, again many States in India imposed lock down in the second wave of Covid-19. Schools and other educational institutions, playgrounds, and entertainment centers for children and adults are shut from the beginning (Lancet, 2020). During the period of lockdown, people suffer psychologically due to the fear of contracting the infection, monetary loss, uncertainty of future, and lack of vent for their stresses. Depression, anxiety, and panic disorders are common psychiatric manifestations in lockdown, as evidenced by a Chinese study (Qiu J et.al 2020).

In the current context of lock down and restriction of movements, young adolescents have constrained access to socialization, play, and even physical contact which is very critical for their psychosocial wellbeing and development. School closures are preventing young adolescents from access to learning and limiting their interactions with peers. Adolescents may feel confused and at loss with the current situation, leading to frustration and anxiety, which will only increase with the overexposure to mass and social media. Given that adolescents seem to be particularly vulnerable to mental health problems (Paus et al., 2008), it is possible that drastic changes to adolescents' everyday lives during COVID-19 may have adverse effects on adolescents' psychosocial functioning.

The purpose of this study is to highlight and understand the psychosocial challenges faced by School going Adolescents during Covid-19 pandemic from the perspective of the teachers and the parents.

II. MATERIALS AND METHODS

The current study is descriptive in design and makes use of Purposive sampling to identify respondents from Nongstoin, West Khasi Hills District of Meghalaya. Semi-structured Interview guide was used among Secondary school teachers and parents to collect the information. Five high School Teachers and Five parents of school going adolescents were interviewed for the study. Informed consent was obtained from the participants prior to starting the interview. Thematic Analysis was used to identify the themes on the Psychosocial Challenges faced by school going adolescents during Covid-19 Pandemic. Data were transcribed by the researcher soon after each interview was conducted, coding of interesting features from the data and identifying patterns of themes.

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Student volunteers' service-learning experiences in the Swastyayan Programme

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Abstract

This case study investigates student volunteers' experiences participating in the Swastyayan Programme as part of their Assam Don Bosco University service-learning program and its impact on their development as socially committed individuals. A sample of twenty Assam Don Bosco University student volunteers from the Swastayan program was selected randomly for inclusion in this case study. Using self-prepared questionnaires, data were collected and analyzed thematically under the categories of head, heart, and hands. According to the results, volunteers had a positive experience and could identify and address community concerns without affecting their academic performance. It was also found that their academic performance improved due to their ability to relate their curriculum to the community's needs. The remarkable aspect of this program was that the student volunteers developed a deep sense of involvement, particularly in assisting neighborhood children, which influenced the other university students and departments to get involved.

Keywords: Swastyayan, Student volunteers, Service Learning.

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Short Communication:

A study of the ITK used in fisheries and Bioresources of Lai Lyngdoh area, West Khasi Hills, Meghalaya

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Abstract: Indigenous traditional knowledge (ITK) has been in use different districts of Meghalaya and it is of different types. In West Khasi hills of district few important ITK is used especially in connection with fish. Besides ITK, bioresources are seen to play an important role in the lives of indigenous communities in Lai Lyngdoh area. The Lai Lyngdoh area in Nongstoin is a group of 34 villages that falls under the jurisdiction of the three Lyngdoh i.e. Marskuin, Nonglwai and Nongkhlaw located in West Khasi Hills District, Meghalaya. The locals in the area mostly depend on the surrounding environment for their livelihood. From the surrounding forests and forest streams, a variety of minor products are harvested and a number of edibles which include wild fruits, leafy green, wild vegetables, mushroom, fish, frog, crustaceans, tubers and medicinal plants are also gathered. Indigenous traditional knowledge (ITK) in the use of bio-resources is still preserved and practised in the indigenous communities and the documentation of local culture and knowledge will play an important role in conservation process. These resources, however, need to be valued and used sustainably so that they can continue to support the community.

Keywords: *Indigenous traditional knowledge (ITK), Bio-resources, Lai Lyngdoh, indigenous knowledge, sustainable use.*

1. INTRODUCTION

Biological resources include all products and services emanating from natural environment that satisfies the needs and wants of human. The purpose of bio-resources is to provide a sustainable response to the need of food

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EFFECTS OF UREA FERTILIZER ON SOME DEVELOPMENTAL STAGES OF THE COMMON ASIAN TOAD, *DUTTAPHRYNUS MELANOSTICTUS*

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ABSTRACT

Most anurans often breed near agricultural sites and are thereby affected by the agricultural contaminants through surface run off. Larval amphibians inhabiting aquatic ecosystem are known to be excellent bio indicators in ecotoxicological studies because of their highly permeable skin. In the present study, we assessed the effect of short-term exposure to urea on some developmental stages (embryos, hatchlings and tadpoles) of the anuran species, *Duttaphrynus melanostictus*. Egg masses of the selected species were collected from Mawsynram, Meghalaya. Gosner stages 9 (embryo), 18 (hatchling) and 25 (tadpole) were subjected to sub lethal (1, 5, 10, 12) in g/L and lethal concentrations (14, 16, 18, 20, 21-28, 30) in g/L. The LC_{50} for all stages were carried out at exposure period of 48 and 96 hours. The findings of the study highlighted that the effect of urea on the amphibian larvae is dosage dependent and sensitivity occurs only at extremely high concentrations where hatchlings are more sensitive than embryos and tadpoles. Morphological changes include compressed and curved body, reduced and bent tail, mucous secretion in the oral sucker among the hatchlings, while swollen head, depigmentation and tail curvature was observed in tadpoles. The behavioural changes such as sluggishness, irregular movement and reduced swimming were observed in the treated larvae exposed to lethal concentrations. The analysis for calculation of LC_{50} values was done using Finney's Probit analysis method (SPSS computer software).

Keywords: Amphibians, larval stages, mortality, urea, nitrogenous fertilizers

INTRODUCTION

Amphibians are group of vertebrates exhibiting their biphasic life cycle in two alternating habitats i.e., terrestrial and aquatic. They exhibit significant role in environment by serving requisite trophic links in the food chain whereby acting both as prey and predators (Junges et al., 2012). The breeding grounds of anurans ranges in a variety of water bodies such as ephemeral pools situated near agricultural fields, permanent ponds, streams and rivers. For decades, there has been an increasing awareness among biologists throughout the world on the widespread decline of amphibian populations at an alarming rate (Blaustein and Wake, 1990; Alford and Richards, 1999; Krishnamurthy et al., 2008; Sayim, 2008; Alton and Franklin, 2017). Multiple factors such as habitat loss, diseases, climate change, UV irradiation, exploitation and introduced species are major contributors to decline in amphibian population (Beebee and Griffiths, 2005; Blaustein et al., 2003). Further, another possible contributing factor includes the use of agrochemicals which favours this decline as amphibians are sensitive to environmental pollution (Blaustein et al., 1994; Blaustein and Wake, 1995).

Many biologists considered amphibians as ideal bio indicators of environmental health and resilience (Blaustein, 1994; Blaustein and Wake, 1995) for studies on environmental pollution since they inhabit both aquatic and terrestrial habitats (Watt and Jarvis, 1997). It is suggested that these lower vertebrates are responsive to agricultural and environmental pollutants during their early aquatic life stages (Vennurino et al., 2003). Freshly hatched larvae which are often restricted to the aquatic habitat can be greatly affected on exposure to pollutants introduced in the water

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First comprehensive study on the breeding activity of *Hyla annectans* Jerdon, 1870 in pristine water bodies of Meghalaya, Northeast India

P. Wankitlang Shangpliang[1,*], Susan Jones Nongkynrih[1], and Rupa Nylla K. Hooroo[2]

Anurans use diverse strata such as puddles, rock crevices, vegetation, humid forest leaf litter, burrows, aquatic vegetation, twigs, and wooden logs as their preferential sites for oviposition. Diverse attributes of an oviposition site may act directly or indirectly in controlling the hatching success, development, and survival of the anuran's larvae, hence strongly determining their parental fitness (Resetarits and Wilbur, 1989). In general, much research has been devoted to elucidating anuran breeding behaviour, reproductive modes, and their interactions with abiotic factors. However, till date few information is available regarding the detailed study of the breeding activity of *Hyla annectans* Jerdon, 1870 in Meghalaya, Northeast India (Hooroo et al., 2017; Shangpliang et al., 2020). A species that occurs in the state of Meghalaya lies in the Indo-Myanmar Biodiversity Hotspot and is home to 61 species of amphibians (Tron et al., 2021).

In the present study, we therefore evaluated the breeding activity of *Hyla annectans* (IUCN Red List: Least Concern), at a study site located in the south-eastern sector of Meghalaya, a region that receives exceptionally high levels of average annual rainfall: 11,871 mm. *Hyla annectans* is a nocturnal, arboreal species that inhabits tropical to sub-tropical broadleaf forest between 100–2500 m elevation. During the breeding season they are semiterrestrial, congregating at small pools or wet terraces in different habitats (from forests to rural disturbed areas) for egg deposition between April–August (Ahmed et al., 2009; Zug, 2022). This study provides life history knowledge which could improve future conservation strategies that target the species' breeding sites which form an important component of the local ecosystem.

Materials and Methods

Breeding activities of *Hyla annectans* were studied at a study site in the Mawsynram region, Meghalaya, Northeast India (25.29745°N, 91.58512°E; elevation 1424 m; Fig. 1). The study site was a temporary ephemeral pool with clear pristine waters, surrounded by shrubs and a few trees such as *Castonopsis indica, Quercus glauca* and *Myrica esculenta* (1.5 m in depth). Meghalaya state is home to a diverse range of vegetation types, including tropical evergreen, tropical semi-evergreen, tropical moist and dry deciduous, subtropical broad leaved hill forest, subtropical pine forests, grasslands and temperate forests (Champion and Seth, 1968; Rao and Hajra, 1986). Fieldwork was carried out during the breeding season over three consecutive

Figure 1. Temporary breeding habitat of Hyla annectans located on the northern ranges of Mawsynram (25.29745°N, 91.58512°E; 1424 m elevation). Photograph by R. J. Kharbhih.

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PENSOFT. SENCKENBERG world of biodiversity Leibniz

The world's largest cave fish from Meghalaya, Northeast India, is a new species, *Neolissochilus pnar* (Cyprinidae, Torinae)

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Abstract

The world's largest subterranean fish was discovered in 2019, and was tentatively identified as a troglomorphic form of the golden mahseer, *Tor putitora*. Detailed analyses of its morphometric and meristic data, and results from molecular analyses now reveal that it is a new species of the genus *Neolissochilus*, the sister taxon of *Tor*. We formally describe the new species as *Neolissochilus pnar*, honouring the tribal communities of East Jaintia hills in Meghalaya, Northeast India, from where it was discovered. *Neolissochilus pnar* possesses a number of characters unique among species of *Neolissochilus*, with the exception of the similarly subterranean *N. subterraneus* from Thailand. The unique characters that diagnose *N. pnar* from all epigean congeners comprise highly reduced eye size to complete absence of externally visible eyes, complete lack of pigmentation, long maxillary barbels, long pectoral-fin rays, and scalation pattern. *Neolissochilus pnar* is distinguished from the hypogean *N. subterraneus*, the type locality of which is a limestone cave ~2000 kms away in Central Thailand, by a lesser pre-pelvic length (47.8–49.4 *vs.* 50.5–55.3 %SL), a shorter caudal peduncle (16.1–16.8 vs. 17.8–23.7 %SL), and shorter dorsal fin (17.4–20.8 vs. 21.5–26.3 %SL). In addition, *Neolissochilus pnar* is also genetically and morphologically distinct from its close congeners with a raw genetic divergence of 1.1–2.7% in the COI gene with putative topotype of *N. hexastichus* and 2.1–2.6% with putative topotype of *N. hexagonolepis*.

Keywords

Eastern Himalaya, limestone cave, mahseer, new species, subterranean fishes

Introduction

Roughly 1.6% (293 species) of all known (~18,000) freshwater fish species live their whole lives either in caves, or in groundwater aquifers (Proudlove 2023). These 'troglobiotic' or 'stygobiotic' fishes occur in 36 countries across six continents, with China harbouring close to one-third (96 species) of the global diversity, followed by Brazil

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Rhizospheres of *Rubus ellipticus* and *Ageratina riparia* from Meghalaya exhibit Actinomycetota that promote plant growth

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ABSTRACT

The mounting pressure on food security due to the increasing human population and climate change has prompted environment-friendly approaches to increase food crop productivity. Medicinal plant-associated microorganisms offer a solution due to their capability to antagonize phytopathogens and promote plant growth. Rhizosphere-dwelling Actinomycetota, which are mostly Gram-positive bacteria with high DNA G + C content, are potential plant growth promoters and biocontrol agents. Due to the infancy of research in medicinal plant-associated rhizosphere Actinomycetota, especially in the state of Meghalaya, India, they were isolated from the rhizospheres of two medicinal plants, *Rubus ellipticus* and *Ageratina riparia*, from Meghalaya, and the isolates were evaluated for their antimicrobial and plant growth-promoting (PGP) activities. Several antimicrobial *Amycolatopsis* strains were isolated from the rhizosphere of *R. ellipticus* and PGP *Streptomyces* strains from the rhizosphere of *A. riparia*. Five isolates were selected and tested for their ability to promote plant growth on tomato plants. All of them could significantly increase seedling vigor and plant growth on soil amended with organic manure. Plant-associated Actinomycetota from the rhizospheres of the two medicinal plants, therefore, exhibited their potential as bioinoculants that can be further developed and applied for increased crop productivity and for the maintenance of food security.

1. INTRODUCTION

The increasing human population and climate change are causing mounting pressure on food security which is dependent on the agricultural sector, particularly food crops. The world's human population is estimated to reach 8.6 billion by the year 2030 [1] and this will lead to a widening gap between food demand and production. Adding to this problem is the anthropogenic activities that have led to climate change resulting in biotic and abiotic stresses in crop plants, which eventually will lead to reduced crop production [1]. Thus, climate change will further widen the food demand and production gap.

Beneficial microorganisms, which can be obtained from within plants or from their rhizospheres, can be used to improve plant growth and crop yield without harming the environment. These microorganisms can directly or indirectly promote plant growth by increasing the availability of nutrients in the soil, fixing nitrogen and making it available to plants, modulating plant growth through the production of growth regulators, and producing compounds that are antagonistic to other pathogenic microorganisms. For many years, rhizosphere bacteria have been used as biofertilizers to promote plant growth and increase crop yield. Plant growth promotion mechanisms mediated by rhizosphere bacteria have been thoroughly studied and elucidated [2], leading to the development of several commercial biofertilizers [3]. Among the rhizosphere bacteria, the Actinomycetota have recently gained importance as plant growth promoters. The phylum Actinomycetota [4] (previously Actinobacteria) are Gram-positive or Gram-variable bacteria that have a rigid cell wall. They are phenotypically diverse ranging from cocci to highly differentiated mycelia with DNA G + C content ranging from 50 mol% to 70 mol% [5]. The phylum has long been known for its ability to produce myriads of metabolites with antimicrobial properties and many of these compounds have reached drug stores today as antibiotics [6]. Actinomycetota isolated from the rhizospheres of various plants have been found to have traits that promote plant growth and biocontrol capability against different phytopathogens [7-11].

Medicinal plants have played important role in the life and health

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pathogens

MDPI

Review

Evaluating Alterations of the Oral Microbiome and Its Link to Oral Cancer among Betel Quid Chewers: Prospecting Reversal through Probiotic Intervention

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Abstract: Areca nut and slaked lime, with or without tobacco wrapped in *Piper betle* leaf, prepared as betel quid, is extensively consumed as a masticatory product in many countries across the world. Betel Quid can promote the malignant transformation of oral lesions as well as trigger benign cellular and molecular changes. In the oral cavity, it causes changes at the compositional level in oral microbiota called dysbiosis. This dysbiosis may play an important role in Oral Cancer in betel quid chewers. The abnormal presence and increase of bacteria *Fusobacterium nucleatum*, *Capnocytophaga gingivalis*, *Prevotella melaninogenica*, *Peptostreptococcus* sp., *Porphyromonas gingivalis*, and *Streptococcus mitis* in saliva and/or other oral sites of the cancer patients has attracted frequent attention for its association with oral cancer development. In the present review, the authors have analysed the literature reports to revisit the oncogenic potential of betel quid and oral microbiome alterations, evaluating the potential of oral microbiota both as a driver and biomarker of oral cancer. The authors have also shared a perspective that the restoration of local microbiota can become a potentially therapeutic or prophylactic strategy for the delay or reversal of lip and oral cavity cancers, especially in high-risk population groups.

Keywords: microbiome; precancerous; lesions; betel quid; arecoline; areca nut

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1. Introduction

Oral cancer (OC) is a major public health problem in South-Central Asia and Oceania (hotspots), with the highest estimated incidence rates in Papua New Guinea, Pakistan, Bangladesh, and India (one-third of total registered OC cases in 2020). According to the International Agency for Research on Cancer (IARC) Registries, GLOBOCAN (2020), Asia alone accounts for 65.8% of the estimated new cases of Lip and Oral cavity cancer (C00-C06) in comparison to Europe (65,279; 17.3%), North America (27,469; 7.3%), and the Caribbean region (17,888; 4.7%) (Figure 1) [1]. In Asia, India registered the highest number (36%) of C00-C06 in terms of total new cases in the South-East-Asia-specific region [1]. Following India, neighbouring countries Pakistan and Bangladesh report the highest incidences and mortality, thereby increasing the burden of OC in the South-East Asian belt (Figure 2) [1,2]. In this region, the age-old tradition of chewing betel quid (BQ) with or without tobacco is deeply rooted and believed to have an origin in moist tropical climates. The rampant chewing of BQ is due to its abundant availability at a cheap cost and the social and cultural imbibition of the practice.

BQ is prepared with betel leaf (*Piper betle*), areca nut (*Areca catechu*), catechu (*Acacia catechu*), and slaked lime with or without tobacco, popularly known as *Paan* in India and

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Classification of Rivers of Brahmaputra Basin in Assam, India Based on Designated Best Use Concept

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ABSTRACT

River water quality is an important issue as rivers are one of the major sources of fresh water for drinking, agriculture, residential use, hydroelectric power plant, tourism, transportation, and others. In spite of abundance of surface water in Brahmaputra basin, only 47% rural population of Assam has access to potable water. It is important to check water quality at regular intervals and prevent and control their pollution. An attempt was made to study water quality of rivers of the Brahmaputra basin in Assam focusing designated best use concept. Water quality status was evaluated from analysis of water samples and secondary data from reports of Central Water Commission and Pollution Control Board, Assam. It is found that water of most of the rivers fall under 'B' and 'C' class (as per designated best use concept, class 'B' water can be used for bathing and class 'C' water can be used as drinking water source with conventional treatment followed by disinfection). Most of the rivers of the Brahmaputra basin have moderate or low pollution, mainly due to rejuvenated life every year during monsoon. However, with contemporary issues of population explosion, increasing demand for water, flood, growing pollution and climate change, it is imperative to take precautionary approach to the pristine as well as ecologically challenged rivers of Brahmaputra basin in India.

Key words: *Brahmaputra basin, Assam, Water quality, Designated best use concept*

Introduction

The Brahmaputra River basin occupies 30% of the country's total water resources and are the highest among all the river basins in the Indian subcontinent. The Brahmaputra along with the well-knit network of its tributaries controls the geomorphic regime of the entire region of the Brahmaputra valley (Mahanta and Saikia, 2015). The major rivers are mostly precipitation dominated during monsoon season and many are snow fed type during the lean flow period. In spite abundance of surface water, according to a UNICEF report, only 47% rural population of Assam has access to potable water. Due to contamination of ground water by arsenic, fluoride and iron, surface water sources, i.e., rivers are suitable options as drinking water sources. It is necessary to monitor water quality of rivers to prevent and control pollution.

Water quality of the Brahmaputra River in Assam have been extensively studied by many researchers (Dutta *et al.*, 2020; Barbulescu *et al.*, 2021). Multivariate statistical techniques were used in Jia Bharali river study for analysis and interpretation of complex datasets, and in water quality assessment, identification of pollution sources/factors and understanding temporal/spatial variations in water quality for effective water quality management (Khound and Bhattacharya, 2017). The overall index of pollution in Jia Bharali river was found to be 0.14 to 1.21

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Review article:

Traditional Practices Pertaining to Sustainable Agriculture in North East India: A Review

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Abstract: Agriculture is the backbone of India's rural economy. Sustainable agriculture needs to emerge at an accelerated pace integrated with technical and traditional knowledge. The advent of the concept of sustainable agriculture in the late eighties in the Indian agricultural scenario has evoked interest in indigenous traditional knowledge (ITK) that uses natural products to solve the problems pertaining to agriculture and allied activities. Since the past centuries, farmers have grown food and survived in harsh environments through the knowledge gained from their ancestors, where such a rich tradition of indigenous traditional knowledge has been interwoven with the agricultural practices followed by them. The northeast region is known for its rich natural scenic beauty, diversity, ethnicity, rare and unique wildlife, people, and culture. The traditional knowledge that the people possess in these regions is a precious resource that is shared through generations. However, such knowledge remains largely unreported, especially from the northeastern region, and has slowly been lost over time. Such knowledge needs to be harnessed along with some technical inputs to make sustainable development faster. There is a need to document and record such traditional knowledge which can act as a foundation for the creation of modern technology. This paper highlights the role and challenges of agriculture to the economy, the indigenous cultivation practices, and the traditional practices in Northeast India for sustainable agriculture.

Keywords: *Sustainable Agriculture, Traditional knowledge, Northeast region, Soil management, Pest management*

1. INTRODUCTION

Agriculture is the backbone of India's rural economy with more than ten crore farm holdings and is considered the lifeline of the Indian economy at least in the

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Topic
Wild Edible Plants (WEPs) of Dkhiah Village, Jaintia Hills District, Meghalaya

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Abstract

Wild edible plants play an important role in meeting food demand for the livelihoods among the rural community are rich in minerals compared to cultivated ones. India has failed to improve food security in various regions. There is a need to document the importance of WEP in rural economy as most rural people utilized wild plants for their livelihood. A large number of plants whose fruits, seed, tuber shoots etc. make an important contribution to the diet of the people particularly to those living near forest and other rural areas. They also provide other useful products viz. medicines, dyes, spices, gums, resins, fibers, etc. Many researchers have studied and documented the uses of wild edible plants among the tribal communities of Meghalaya including Jaintia hills. Scientists are interested in studying such plants and realized their importance in rural communities. The present study aims to study the awareness of WEPs, to document their availability and also to study their uses among the Jaintia tribes of Dkhiah Village.

Keywords: Wild Edible Plants (WEPs), North East Region (NER), vegetables, fruits, medicinal plants

Introduction

Wild edible plants (WEPs) are those plant species which grows in a diverse wild habitat such as a forest and covers uncultivated or undomesticated species which are not easily accessible. They are gathered or harvested from the wild and acts as affordable food and nutritional security for meeting the daily needs of the rural traditional community (Bhatia et al., 2018). Wild edible plants which play an important role in meeting food demand for the livelihoods among the rural community are rich in minerals compared to cultivated ones (Thakur et al., 2020).

Although India is a developing country and a land of rural villages, elevated rate of poverty persists among rural communities, despite the green revolution. Even though it has been reported that there is an increase in the per capita energy consumption and high economic growth, India has failed to improve food security in various regions including North East Region (NER) (Thakur et al., 2020). There is a need to document the importance of WEP in rural economy as most rural people utilized

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The faster evolution of signal peptide genes of *Frankia* in surfactome may be attributed to their cardinal role in symbiotic association

Sutapa Datta[1] · Indrani Sarkar[2] · Sandipan Ghosh[1] · Sanjiban Goswami[3] · Gargi Sen[2] · Arnab Sen[1,2,4]

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Abstract

The analysis of transmembrane proteins in *Frankia* genomes provided insight into the host-microbe interaction strategy of this nitrogen-fixing Actinobacteria. The transmembrane proteins (TM) with their extracellular part exposed on the surface of the cell and the peripheral membrane proteins play a crucial role in the interaction of *Frankia* with the infected host plant and are termed as 'surfactome' for this study. Our analysis identified two categories of transmembrane proteins: signaling-TM (STM) and non-signaling TM (NSTM) proteins. The STM category was further subdivided into Lipo, Sec, and TAT. The codon and amino acid usage analysis revealed the importance of compositional constraints, translational efficiency, tRNA adaptation index, and RSCU over *Frankia*. The COG analysis proved the role of surfactome in signal transduction. It was evident that STMs were evolving faster than NSTMs. Moreover, the signal part of the STM proteins was found to be more evolved than the mature part. This rapid evolution enables the signaling proteins to interact with diverse external stimuli more effectively, which may be essential for the host-microbe association between *Frankia* and Actinorhizal plants. In conclusion, the comprehensive analysis of surfactome among *Frankia* genomes provided valuable perceptions into the host-microbe interaction strategy of this nitrogen-fixing actinobacteria. The results suggest that the composition and evolution of these proteins are essential for successful host-microbe associations. Considering the uniqueness of these proteins we coined the term "surfactome" for them and called for further research on the mechanisms of plant–microbe interactions.

Keywords *Frankia* · Host-microbe interaction · Surfectome · Transmembrane proteins · Codon useage

1 Introduction

The genus *Frankia* consists of a number of well-known Gram-positive to Gram-variable microbes under Actinomycetes. They are popular, especially for their symbiotic and nitrogen-fixing capacity. However, several other factors make them noticeable. Based on the 16 s rRNA analysis, *Frankia* has been classified into four groups (C-I, C-II, C-III, C-IV) (Normand et al. 1996). C-I is again subdivided into two, CI-a and CI-c. CI-a represents *Frankia* infecting a wider range of host plants from *Betulaceae*, and *Myricaceae* families. CI-c subcluster is limited to *Casuarina* and *Allocasuarina*. *Dryadoideae* (*Rosaceae*), *Coriariaceae* and *Datiscaceae*, and *Ceanothus* (*Rhamnaceae*) are infected by C-II. C-III *Frankia* is most promiscuous and infects *Elaeagnaceae*, *Rhamnaceae*, *Myricaceae*, *Gymnostoma* (*Casuarinaceae*), and occasionally *Alnus*. The C-IV cluster is mainly comprised of 'atypical' *Frankia* strains unable to infect actinorhizal host plants. C-IV strains sometimes form ineffective root nodule structures that are unable to fix nitrogen (Ghodhbane-Gtari et al. 2013 et al. 2013; Pujic et al. 2015; Tisa et al. 2015). Recent studies encompassing phenotypic, phylogenetic, and genomic analyses have made significant contributions to the taxonomy of the *Frankia* genus, resulting in a refined species identification and classification (Gtari 2022; Marappa et al. 2020; Berckx et al. 2022; Gtari et al 2019, 2013; Nouioui et al. 2019a, b). Phenotypic investigations involved meticulous observation and characterization of physical traits

Sutapa Datta and Indrani Sarkar have equal contribution.

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SCIENTIFIC Research and Community

Review Article

Open Access

Navigating the Future: Nanotechnological Strategies for Tackling Hepatocellular Carcinoma

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ABSTRACT

Hepatocellular carcinoma (HCC), a widely prevalent form of liver malignancy, is a leading contributor to cancer-related mortality globally, despite advances in preventive and diagnostic technologies. It is closely associated with cirrhosis, with major contributions from hepatitis B and C infections and alcohol consumption. Early detection of HCC is crucial as it is often diagnosed at an asymptomatic stage. Radiological screenings and serological markers are effective methods of achieving early detection. Various surgical methods, including liver transplantation, and therapies such as radiofrequency lesioning and chemoembolization, are employed to treat this disease. However, due to limited donor availability and late diagnosis, treatment can be delayed. Tumour size, liver disease severity, and patient's overall health are among the factors that influence the disease. Nanotechnology, a field that involves the precise manipulation of materials at the nanometer scale and the targeted delivery of therapeutic agents, presents a promising solution for HCC therapy. The utilization of nanoparticle-based therapies allows for the specific targeting of tumour-associated antigens, which enhances drug delivery and reduces drug-induced toxicity. Furthermore, nanomaterials such as carbon nanoparticles and biochemical sensors aid in the detection of oncological markers. Nanomedicine-based approaches possess the potential to revolutionize HCC therapy by improving drug delivery and targeting liver cancer stem cells. Specifically, targeted ligand-mediated therapy using saccharide or polysaccharide compounds, antibodies, peptides, and aptamers shows promise for liver-specific HCC treatment. Additionally, nanotherapy aimed at liver cancer stem cells (LCSCs) provides new possibilities to overcome the limitations of conventional treatments and improve patient outcomes. Ultimately, nanotechnology-based approaches hold great potential in enhancing the effectiveness of HCC therapy and offer new avenues for precision medicine in cancer treatment.

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Keywords: Nanoparticle-Based Therapies, Liver-Specific Targeting, Cancer Stem Cells, Nanomedicine

Introduction

Cancer is one among the preeminent contributor to mortality on a global scale [1]. Hepatocellular carcinoma, commonly referred to as HCC, has emerged as the most frequently encountered variant of malignancy in the liver. The mortality rate of this disease is quite high worldwide. Regardless of all the new preventive technologies for both diagnosis and prognosis, until now, it remains as the foremost factor contributing to fatalities caused by cancer. Hepatitis B & C play individualistic roles to develop cirrhosis. Alcohol consumption is positively associated with an elevated risk of developing cirrhosis. The detection of this disease can be confirmed by using radiological screenings such as computerized tomography (CT scan), ultrasound, magnetic resonance imaging (MRI), and the use of serological markers such as α-fetoprotein, have been employed at intervals of six month [2]. Usually, the disease is confirmed at an asymptomatic stage in most of the patients. The notable factors to be taken into account are the [illegible] disease but certain factors like limited availability of donors and late diagnosis might delay the treatment [3].

The treatment methods for this disease includes incision of the liver, radiofrequency lesioning, transcatheter arterial chemoembolization. Incision of liver is not recommended to every patient of HCC [4]. It is only performed in patients at the very beginning of malignancy. Some of the post-hepatectomy symptoms in patients include leakage of bile fluids, hepatic failure, fever and also low level of tolerance in patient's post-surgery [5]. The chances of hepatic cancer can be increased by hepatic fibrosis, chronic hepatitis, non-alcoholic fatty liver disease (NAFLD), aflatoxicosis etc. The manifestation of HCC is heavily influenced by genetics, implying a crucial role of genetic factors in its emergence [6]. Nanotechnology, a pioneering scientific methodology utilized for the precise design of materials at the nanometer scale, incorporating biomimetic, biological and biologically-inspired molecules. Applications of chemistry, biology and quantum mechanics is used in this field. Based on three features i.e., direct, indirect and conceptual, nanotechnology is often regarded to be an innovative tool [7]. Throughout the years, by the use of nanotechnology the various immunotherapeutic agents have been

Discrete interplay of gut microbiota *L*-tryptophan metabolites in host biology and disease

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Molecular and Cellular Biochemistry

Aims and scope

Submit manuscript

Harmit S. Ranhotra

Abstract

The gut microbiota and the host maintain a conjoint relationship and together achieve optimal physiology via a multitude of interactive signalling cues. Dietary-derived *L*-tryptophan (*L*-trp) is enzymatically metabolized by the resident symbiotic gut microbiota to indole and various indole derivatives. Indole and indole metabolites secreted by the gut bacteria act locally in the intestinal cells as well as distally and modulate tissue-specific functions which are beneficial to the host. Functions attributed to these