7th Regional Science & Technology Congress, 2025

Region: 6

Organized by

Presidency University, Kolkata

In collaboration with

Department of Science and Technology and Biotechnology, Government of West Bengal

Abstract Volume

17th - 18th January 2025

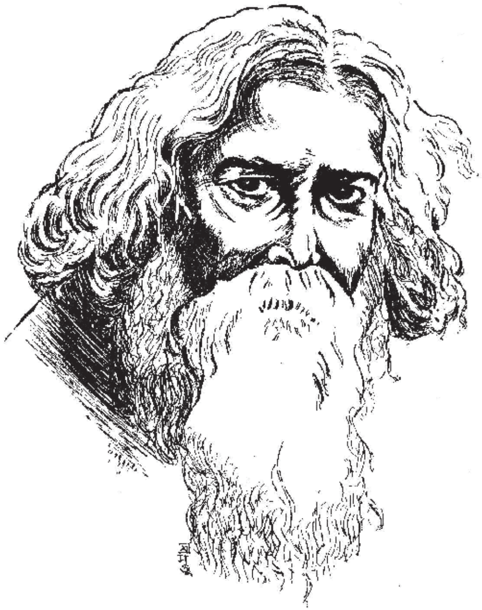
"UTTARAYAN"
SANTINIKETAN

অস্তরবির আলো শতদল
মুদিল অন্ধকারে।
ফুটিয়া উঠুক নবীন ভাষায়
শ্রান্তিবিহীন নবীন আশায়
নব উদয়ের পারে।

রবীন্দ্রনাথ ঠাকুর

১ ভাদ্র
১৩৪৪

[১৯৩৭ সালে প্রেসিডেন্সি কলেজ পত্রিকায় প্রদত্ত বাণীর পুনর্মুদ্রণ



শিল্পী—মঞ্জুবিকাশ বসু
চতুর্থ বর্ষ, আর্টস্

A short poem in Rabindranath's handwriting, written for the college, in 1937, which was printed in that form in the college magazine in 1937. The same however was reprinted in 1948 where a sketch of Tagore drawn by a student of the college has been placed next to the poem.

PRESIDENCY
UNIVERSITY
KOLKATA

Hindoo College (1817-1855), Presidency College (1855-2010)

Presidency University has a unique place in history. It was one of the earliest institutions of higher learning in the modern sense in Asia. In 1817 a group of enlightened Indians and Englishmen set up the Hindoo College. It was taken over by the British Government in 1855 as the College of the Bengal Presidency, and renamed Presidency College. The college was placed under the newly founded Calcutta University in 1857.

Over the next hundred years and more, Presidency College was Bengal's pre-eminent centre of higher learning. Although a constituent college of Calcutta University, it preserved a tradition of research matched by few universities in India. This imparted a unique dimension to its undergraduate teaching.

Presidency College steadfastly produced generations of legendary students, teachers and scholars in the sciences and the humanities. Out of some of its most famous traditions of scientific research, emerged two of India's earliest and most significant research institutes—the Bose Institute and the Indian Statistical Institute. This institution, thus, produced the ideal model of liberal education in India where pedagogy and research of the highest international standard merged seamlessly with each other.

In recognition of its rich heritage of academic excellence, the Legislature of West Bengal conferred the status of a University on Presidency College on 7th July of 2010. The formal establishment of Presidency University allowed it to refashion its venerable tradition and continuing strengths into a leading institution of the future. This tradition of a glorious history is one of the greatest strengths of the University.

Presidency University is committed to providing a learning experience that goes beyond traditional academics. It strives to build intellectual networks at the global, national, and local levels and to strengthen existing connections in order to produce cutting-edge research in significant fields.

MESSAGE FROM MIC

উজ্জল বিশ্বাস
(ভারপ্রাপ্ত মন্ত্রী)
বিজ্ঞান ও প্রযুক্তি এবং জৈবপ্রযুক্তি দপ্তর
পশ্চিমবঙ্গ সরকার
বিজ্ঞান চেতনা ভবন
২৬/বি, ডিডি ব্লক, সেক্টর - ১, সল্টলেক
কোলকাতা - ৭০০ ০৬৪
দূরভাষ ঃ (০৩৩) ২৩৩৪-৮০৭৪, ২৩৩৪-১৪৩৩
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MESSAGE

Department of Science & Technology and Biotechnology, Government of West Bengal organises West Bengal State Science and Technology Congress to provide a forum for Scientific Research especially for young scientists and to synergise new ideas with societal needs. State level programme will be participated by the best participants of six Regional Science & Technology Congresses to be held across the State in collaboration with various colleges and universities as a precursor of the programme.

Presidency University, Kolkata has taken a leading responsibility for hoisting the 7^{th} **Regional Science and Technology Congress, Region-6 on 17^{th} and 18^{th} January,2025**. I would also extend my heartfelt gratitude to the organisers.

I take this opportunity to welcome all the participants to 7^{th} Regional Science & Technology Congress to be held at Presidency University, Kolkata and wish the event a resounding success.

(Ujjal Biswas)
UJJAL BISWAS
Minister-in-Charge
Department of Science & Technology
and Biotechnology
Government of West Bengal

To,

Dr. Soumendu Chatterjee, Professor
Nodal Officer, 7th Regional Science and Technology Congress
Region 6 (KMC area)
Presidency University, Kolkata

Message from
PROF. NIRMALYA NARAYAN CHAKRABORTY
Vice-Chancellor, Presidency University

It is indeed a matter of great privilege that Presidency University Kolkata and the Department of Science and Technology and Biotechnology, Government of West Bengal will jointly organize the 7th Regional Science and Technology Congress, 2025 from 17– 18 January 2025 at the Presidency University Campus, 86/1, College Street, Kolkata-73. Presidency University has an outstanding tradition of excellence not only in academics but in diverse fields that stimulate vibrant intellectual activity, making us an apt co-host of the 7th Regional Science and Technology Congress.

The West Bengal Science and Technology Congress is aimed at fostering scientific temper in young minds and providing a platform for researchers and scientists to share their experiences, and synergize new ideas and research findings for promotion of the science and technology in the state.

I wish the program a huge success with all the memorial lectures, invited lectures, and technical sessions for budding scientists and research scholars. Also, I extend my heartfelt thanks to the Department of Science and Technology and Biotechnology, Government of West Bengal for their generous support in organizing this programme. I also take the opportunity to thank my colleagues, and administrative officers for working together to make this event a huge success.

Message from

DR. DEBAJYOTI KONAR

Registrar,Presidency University, Kolkata

Presidency University, erstwhile Presidency College, is acclaimed for pioneering discoveries of Jagadish Chandra Bose and Prafulla Chandra Ray in Physics / Plant Physiology and Chemistry made in the very lab of this heritage institute. Distinguished alumnus of this 208 year old institute namely S.N.Bose, M.N.Saha, P.C.Mahalanobish, Amal Kumar Raychaudhuri, Shyamal Sengupta, Ashoke Sen had made world-class contribution in the field of basic sciences.

This institute is the very place from where innovations in Science started and to host the 7th Regional Science & Technology Congress in collaboration with WBDSTBT is a matter of great delight to the institute.

We hope that Presidency University together with this Regional Congress, a precursor to the 32nd West Bengal State Science and Technology Congress, would encourage and provide a platform to the young scientists, researchers to contribute their novel ideas alongside eminent Scientists & Professors of the various regions of West Bengal.

SPECIAL LECTURES

Keynote Address

Title of the Talk : Why Some Scientists Believe the Future of Medicine Lies in Creating Digital Twins?

Professor Peter Coveney
Professor of Physical Chemistry
University College London
United Kingdom

Prof. P.C. Mahalanobis Memorial Lecture

Title of the Talk : A tribute to the father of Indian Statistics: Prof. Prasanta Chandra Mahalanobis

Professor Syamal Roy
ICMR Emeritus Scientist
Infectious Diseases and Immunology
CSIR- Indian Institute of Chemical Biology, Kolkata

Sir J. C. Bose Memorial Lecture

Title of the Talk : We Came Out And Saw That We Were Not Alone. And When?

Professor Partha Pratim Majumder
National Science Chair, Govt. of India &
Distinguished Professor and Founding Director National Institute of Biomedical Genomics, Kalyani

Sir C. V. Raman Memorial Lecture

Title of the Talk : Malaria, a re-emerging threats: need for the identification of new antimalarial drug target and drug

Professor Uday Bandyopadhyay
J C Bose National Fellow and Former Director
Bose Institute, Kolkata

KEYNOTE ADDRESS

Why Some Scientists Believe the Future of Medicine Lies in Creating Digital Twins?

PETER COVENEY

Professor of Physical Chemistry, Honorary Professor of Computer Science,
and Director of the Centre for Computational Science (CCS) and Associate Director of the Advanced
Research Computing Centre at University College London (UCL)

The virtual human concept is a compelling one, offering an in-silico environment — now known as a digital twin — within which truly personalized medicine can be implemented, taking into account the specific features of every one of us as an individual, from our personal genome to the anatomy of our connected organ systems, and beyond into human populations and clinical trials. Such virtual humans will not only support medical and clinical treatment and decision making, they will also reduce the need for animal testing and serve as personal avatars which will assist every one of us in making healthcare and lifestyle choices. The theory, modelling, software, and computational challenges associated with the virtual human are immense and will require many years of intensive research effort to bring to fruition. However, the modern principles of modular assembly of tried and tested components will take advantage of the considerable progress already being made in many aspects of the overall virtual human. Indeed, building virtual humans presents a multiscale challenge, as we must integrate data and models at every level ranging between molecular, subcellular, cells, tissues, and organs (and even beyond the single human to population health to address epidemiological issues). My talk will exchange recent breakthroughs in HPC and make comparison with other ambitious digital twin projects underway today and outline several biomedical issues which are being addressed today, based on various components of the future virtual human. These examples illustrate how future patient-specific medical treatments will draw increasingly on the massive power of modern IT systems, including big data, artificial intelligence, and supercomputing

SIR JAGADISH CHANDRA BOSE MEMORIAL LECTURE

We came out and saw that we were not alone. And then?

PARTHA P MAJUMDER
National Science Chair, SERB, Govt. of India

Acharya Jagadis Chandra Bose has said "*I have sought permanently to associate the advancement of knowledge with the widest possible civic and public diffusion of it*; …" It is in this spirit that I seek to share some knowledge of early (400,000 to 30,000 years ago) human evolution acquired during the past decade. In particular, I shall narrate the joys and sorrows of innovative scientific pursuits and the impact of success, using human evolution as an exemplar.

PROF. PRASANTA CHANDRA MAHALANOBIS MEMORIAL LECTURE

A tribute to the father of Indian Statistics: Prof. Prasanta Chandra Mahalanobis

SYAMAL ROY

INSA Senior Scientist, Indian Association for the Cultivation of Science, Kolkata

Former Chief Scientist, CSIR-Indian Institute of Chemical Biology

This is a tribute to the father of Indian Statistical sciences, Prasanta Chandra Mahalanobis. It is difficult to capture the essence of the great man because his accomplished are truly extraordinarily diverse. He has inspired large number of young people that gradually grew with the pioneering work of the group of his colleagues. “Mahalanobis distance” is one of the most widely used metrics to find how much a point diverges from a distribution, based on measurements in multiple dimensions. It is widely used in the field of cluster analysis and classification. Mahalanobis also took an interest in physical anthropology and in the accurate measurement of skull measurements for which he developed an instrument that he called profiloscope. In later life, Mahalanobis was a member of the planning commission contributed prominently to newly independent India & # 39;s five-year plans starting from the second. In the second five-year plan he emphasized industrialization. He played a key role in the development of a statistical infrastructure resulting in the establishment of the Indian Statistical Institute. In the 1950s, he played a critical role in the campaign to bring India its first digital computers. Mahalanobis also had an abiding interest in cultural pursuits and served as secretary to Rabindranath Tagore. He received India’s second highest civilian award, the Padma Vibhushan from the Government of India for his contribution to science and services to the country.

SIR C. V. RAMAN MEMORIAL LECTURE

Malaria, a re-emerging threats: need for the identification of new antimalarial drug target and drug

UDAY BANDYOPADHYAY

J C Bose National Fellow and Former Director
Bose Institute, Kolkata

Malaria remains a significant global health burden because of the development of multi- drug resistance. It results in substantial morbidity and mortality, particularly among children and pregnant women. Malaria parasites have evolved complex strategies to maintain their life cycle, evade the human immune system and develop drug resistance. One key aspect of their success, is their ability to switch between different life stages, each with distinct characteristics that help them survive and reproduce. Additionally, the parasite's genetic diversity allows it to rapidly adapt to new environments and pressures, including the development of drug resistance. This adaptability, combined with its intricate life cycle, makes a formidable challenge to effective malaria control. Further the unavailability of an effective malaria vaccine, poses a significant threat, thus necessitating the identification of novel antimalarial drug targets and thereby new drugs. By understanding the parasite's unique biology and identifying its vulnerabilities, new drugs can be developed with distinct mechanism of action, reducing the risk of resistance and improving the treatment outcome. This targeted approach is crucial in the ongoing fight against this deadly disease.

LEAD LECTURES IN TECHNICAL SESSIONS

Sl No.	Subject Area	Lead Speaker
1.	Physical Sciences	**Prof.Subinit Roy** *Adjunct Professor, Department of Physics, University of Calcutta, Kolkata,Professor (Retired), Nuclear Physics Division, Saha Institute of Nuclear Physics, Kolkata* **Nuclear Reactions in Astrophysics - Probing the Reaction Rates**
2.	Chemical Sciences	**Prof. Tarun Kumar Mandal** *School of Chemical Sciences, Indian Association for the Cultivation of Science* **Coulombi Interaction-Driven UCST Polymers and Materials Therein**
3.	Statistics, Mathematical Sciences,IT and its Applications	**Prof. Alok Goswami** *Visiting Professor, School of Mathematical and Computational Science, Indian Association for the Cultivation of ScienceEx HAG Professor, Indian Statistical Institute, Kolkata* **A Masterstroke of a Mathematical Genius**
4.	Engineering Science and Technology	**Prof. Gupinath Bhandari** *Dept. of Civil Engineering, Jadavpur University* **Conflict between environment and develo-pment: Sundarban case study**
5.	Earth Sciences including Geo-informatics and Hydrogeology	**Prof. Prasanta Sanyal** *Indian Institute of Science Education and Research, Kalyani, Kolkata* **Impact of climate and anthro-pogenic activities in the Ganga River system**
6.	Botany	**Prof.Rintu Banerjee** *Deputy Director, Importance of sustainable approaches for cost-effective product and process development adopting circular economy*

Sl No.	Subject Area	Lead Speaker
7.	Zoology	**Prof. Biswadip Das** *Head, Department of Life science & Bio-technology, Jadavpur University* **The Happy and versatile Life of Eukaryotic messenger RNA**
8.	Biotechnology	**Prof. Maitrayee Dasgupta** *Department of Biochemistry, University of Calcutta* **Biotechnological Solutions to Nitrogen Crisis**
9.	Physiology and Medical Sciences including Forensic sciences	**Prof. Debidas Ghosh** *Department of Bio-Medical Laboratory Science and Management, Vidyasagar University* **Herbal Drug Development: Nature's Contribution for Therapeutics**
10.	Environmental Sciences including Climate Change	**Dr. Kalyan Rudra** *Chairman, West Bengal Pollution Control Board* **Climate Emergency : Century-Scale Experience in West Bengal.**
11.	Agriculture, Horticulture, Fisheries and Veterinary Sciences	**Prof. Anita Mukherjee** *Centre of Advanced Study, Department of Botany, University of Calcutta* **Vetiver grass-the miracle plant for environmental conservation**
12.	Applications of Emerging Technologies including AI/ML in Sustainable Development	**Prof. Sugata Senroy** **(Prof. P. C. MahalanobisMemorial Lecture II)** *Department of Statistics, University of Calcutta* **A Semiparametric Mixed Model for Nonlinear Subject Specific Hazard Estimation : An Application to Cricket Data** **Dr. Tirthankar Ghosh** *Department of Statistics, Visva Bharati* **Sustainable Development in the Age of AI: Opportunities, Challenges and Future Directions**

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2. Prof. Zakir Husain (Department of Economics)

Members:

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4. Prof. Sankar Bose (Department of Geology)
5. Prof. Suhrita Saha (Department of Sociology)
6. Prof. Mousumi Dutta (Department of Economics)
7. Prof. Avishek Adhikari (Department of Mathematics)
8. Dr.. Souryadeep Mukherjee (Department of Life Sciences)
9. Dr.. Suranjana Banerji (Department of Geography)
10. Dr.. Antara Ray (Department of Sociology)
11. Dr.. Hia Sen (Department of Sociology)
12. Dr.. Anirban Ray (Department of English)
13. Dr.. Devarati Jana (Department of Bengali)
14. Dr.. Priyanka Das (Department of English)

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2. Dr.. Tanwir Arshed (Department of Political Science)

Members:

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4. Dr.. Biplab Biswas (Department of Chemistry)
5. Dr.. Mery biswas (Department of Geography)
6. Dr.. Jayeeta Deshmukh (Department of Economic)
7. Dr.. Garima Dhabhai (Department of Political Science)
8. Dr.. Manoranjan Prasad Sing (Department of Philosophy
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12. Dr.. Supriya Pan (Department of Mathematics)
13. Dr.. Nabendu Biswas (Department of DLS)
14. Dr.. Sobhan Kumar Sounda (Department of Physics)

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3. Dr. Pravesh Tamang (Department of Economics)
4. Dr. Priyank Pravin Patel (Department of Geography)
5. Dr. Bidyut Mondal (Department of Philosophy)
6. Mr. Somen Dey (Department of Geography)

D. Refreshment Committee

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1. Dr. Zaad Mahmood (Department of Political Science)
2. Dr. Piyali Mukherjee (Institute of Health Science)

E. Finance Committee

Convenor:

1. Prof. Gagari Chakraborty

Members:

2. Prof. Arnab Halder (Department of Chemistry)
3. Dr. Sukanta De (Department of Physics)
4. Dr. Atanu Ghosh (Department of Statistics)

F. Special Committee for Inaugural and Valedictory Sessions

Members:

1. Dr. NilaDr.i Roy (Department of Performing Arts)
2. Dr. Debaroti Chakraborty (Department of Performing Arts)

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EARTH SCIENCES

INCLUDING GEO-FORMATICS AND HYDROGEOLOGY

ABSTRACT ID : 032509

DETECTION OF COASTAL DEPOSITION PATTERN IN INDIAN SUNDARBAN BY COASTAL MODELLING SYSTEM(CMS)

Satabdi Roy
Assistant Professor
Department of Geography, Lady Brabourne College
Email: sroynet2007@gmail.com

The coastal part of West Bengal specially the Sundarban is the most dynamic area of the state. The region is an active delta with river deposition and coastal action. Erosion and deposition both are active in the same part. It has immense impact in the deposited particles, configuration of the land, tidal hydrodynamics, biodiversity depletion and local economic activities. The present research work is based on these problems. The research work unfolds the detailed study about the science of deposition along the coastal belt of Sundarban in a time frame of fifty years. So, it will show the scientific explanation of the same with some scientific methodologies. Particle analysis by survey method and a wide range of geospatial data will be considered for this. Apart from deposited particles and satellite images, the tidal chart and Biodiversity vulnerability assessment studies will enhance the scope of the present research work. The outcome will be a co-representation of deposition pattern analysis and their impact on land and people. Eventually, coastal modelling system will give an outlook of the entire scientific concept of the subject of interest.

ABSTRACT ID: 032754

CHANGES IN SEA SURFACE TEMPERATURE IN THE BAY OF BENGAL OVER THE TWO DECADES FROM 2000 TO 2019

Swarnendu Saha[1]
[1] *Indian Institute of Science Education and Research Kolkata*
Arnab Mukherjee[2]
[2]*National Centre for Polar and Oceanic Research Goa*

Sea Surface Temperature (SST) is crucial for understanding Earth's climate. This study analyzes SST trends in the Bay of Bengal (BoB) from 2000 to 2019 using AVHRR data, dividing the BoB into Northern (NBoB), Western (WBoB), Eastern (EBoB), and Central (CBoB) regions. The Malacca Strait shows an annual warming trend of 0.0177°C/year, with the highest increase in SON and minimal change in JJA. In EBoB, Mali Kyun, Myanmar, records the highest trend (0.0381°C/year), while the Palk Strait experiences cooling in MAM. Teknaf in NBoB is relatively stable, but other regions show seasonal SST fluctuations due to monsoonal patterns.

NBoB's highest trend is at Teknaf (0.0350°C/year) and the lowest southeast of Puri (0.0106°C/year). In WBoB, Central BoB has the highest trend (0.0130°C/year), while east of Visakhapatnam shows the lowest (0.0116°C/year). SBoB's highest trend is at Indira Point (0.0219°C/year), with the lowest south of Hambantota (0.0061°C/year). Seasonal SST patterns vary, peaking in NBoB during JJA, in EBoB during SON and JJA, and across all seasons in SBoB. The Andaman Sea shows seasonal variation in SON, DJF, and MAM.

AVHRR data reveal substantial spatiotemporal variability, driven by local processes and large-scale events like ENSO and IOD. El Niño raises SST, while La Niña cools it. Long-term warming trends, highlighted by a 400-day low-pass filter, are linked to global warming, offering valuable insights for regional climate models and forecasts

ABSTRACT ID: 072149

ASSESSMENT OF SOURCE, DEPOSITIONAL ENVIRONMENT AND MATURITY OF ASHOKNAGAR CRUDE OIL USING STABLE CARBON ISOTOPE AND AROMATIC HYDROCARBON DISTRIBUTION

[1]Pravat Kumar Behera*, [1]Supriyo Kumar Das

[1]Department of Geology

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The Ashoknagar in West Bengal has been the sole oil-producing well in the Indian section of the Bengal Basin. A series of organic geochemical analyses have been performed on crude oil from Ashoknagar, and various organic geochemical proxies have been used to assess the source, depositional environment, and maturity of the oil. The aliphatic and aromatic fractionation from the crude oil is performed using column chromatography and the fractions are analyzed using a quadruple GC-MS/MS. The low sulfur content of the oil (0.03 %) suggests the non-marine nature of the oil. The low abundance of dibenzothiophene is consistent with the non-marine source. Further, the stable carbon isotope ($\delta^{13}C$)of aliphatic (-24.95‰) and aromatic (-24.63‰) fractions and low abundance of 1,2,5- and 1,2,7-trimethylenapthalenes indicate a terrestrial origin of the source rock organic matter. The low abundance of dibenzothiophene/phenathrene ratio (0.1) and moderate pristine/phytane ratio(1.9) indicate a lagoonal and sub-oxic depositional environment of the source rock. Vitrine reflectance, calculated from themethylephenathrene index (VRc %) and methyle-dibenzothio-pheneratio (VRm %) using an empirical formula, indicates an early stage of maturation of the Ashoknagar crude oil.

ABSTRACT ID: 090602

LANDSLIDE SUSCEPTIBILITY OF AIZAWL DISTRICT, MIZORAM, USING AHP METHOD.

[1]Sagnik Karmakar*, [2]Priyobrata Banerjee, [3]Shourya Das,

[1 2 3]Calcutta University

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In the verdant hills of Aizawl, Mizoram, landslides pose significant threats to both lives and livelihoods. This study harnesses the Analytic Hierarchy Process (AHP) within ArcGIS to delineate landslide susceptibility zones. AHP is a powerful method for landslide susceptibility analysis as it combines qualitative and quantitative approaches, enhances decision-making and supports effective risk management strategies by prioritizing the integrating critical factors like topography, soil composition, land use, and rainfall intensity of the area under study. The results indicate that areas with steep slopes and loose, highly saturated soils are particularly susceptible, exacerbated by anthropogenic factors such as deforestation and unplanned urbanization. The susceptibility map generated from the method consists of zones categorized into low, moderate, and high-risk areas. The resulting susceptibility map serves as a vital resource for local planners as a guiding effective land use strategies and disaster preparedness measures. Ultimately, this research not only illuminates the pressing challenges faced by Aizawl but also advocates for sustainable practices to mitigate the impact of natural hazards.

ABSTRACT ID: 111906

HOW DOES HABITAT (DIS)CONNECTIVITY INFLUENCE WATERBIRD COMMUNITY DYNAMICS IN A FLOODPLAIN LANDSCAPE? A STUDY OF GANGA-ICHHAMATI INTERFLUVE, INDIA

Biyas Dey*, Debajit Datta

Landscape Ecology Laboratory, Department of Geography,
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Floodplain landscape of Ganga-Ichhamati interfluve, eastern India, has rendered unique habitat conditions to a diverse range of species. However, increasing anthropogenic stresses have triggered alterations in their ecological health. Waterbirds, local or migratory, are often most sensitive to these changes and, thus, regarded as important bio-indicators of landscape health. This study investigated the spatio-temporal correspondence between waterbird habitability and landscape-level environmental conditions, i.e. how habitat quality and patch-corridor-matrix dynamics affect the waterbird distribution in a humanized landscape. While various landscape-level spatial processes and environmental covariates were parameterized and assessed applying geospatial techniques; ecological indicators of waterbird community structure and composition were computed based on wetland-wise line-transect data and, thereafter, applied to construct a Community Ecological Health Index of waterbirds ($CEHI_w$). The relationship between $CEHI_w$ and applied covariates was developed using parametric and non-parametric predictive modeling and then spatially explicit mapping of present landscape health status of different grid-plots was done. Eventually, the change in waterbird count was also estimated employing modeled $CEHI_w$ values. The findings recognize better habitability across agglomerated wetlands by virtue of their spatial proximity to the perennial river channels compared to the isolated ones. Besides, presence of fluvial and vegetated corridors between wetlands amidst the densely populated floodplain was identified as one of the prime determinants of habitability. Examination of these features can be directly used as environmental proxies for site-specific interventions towards floodplain landscape management.

Abstract ID: 045659

ENIGMATIC PRESENCE OF RHIZOCONCRETION AND MAGNETITE GRAINS IN REMOTE SUNDARBANS & ENVIRONMENTAL SIGNIFICANCE

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[3]***Punarbasu Chaudhuri***

[3]*Department. of Environmental Science,*
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**imainak7@gmail.com*

Enigmatic presence of rhizoconcretions and magnetite grains are observed on the remote Halliday Island (21° 39' 59.5" N, 88° 37' 57.4" E) in the Sundarbans, West Bengal. Rhyzoconcretions form with the participation of organic root exudates on the floodplain under alternating redox conditions. This study aims to investigate the mineralogy of rhizoconcretions using optical microscopy. Thin section studies reveal an abundant presence of hematite (99%) along with some amount of plagioclase feldspar $(Na,Ca)(Si,Al)_4O_8$ (1%) in the carbonate matrix. The presence of carbonates was confirmed using HCl acid. Fluctuating redox conditions can drive the transformation of iron (Fe), where ferrous ions (Fe^{2+}) migrate toward oxygenated regions near the roots and oxidize to ferric ions (Fe^{3+}). Under anoxic conditions, Fe^{3+} can be reduced back to Fe^{2+}, potentially forming magnetite. By investigating these geochemical processes, this research aims to elucidate the role of rhizoconcretions and magnetite in metal sequestration and nutrient cycling, contributing to a deeper understanding of sedimentary dynamics within the mangrove ecosystem.

ABSTRACT ID: 071141

EVOLUTION OF THE THAR DESERT, INDIA: A DETRITAL ZIRCON PROVENANCE STUDY

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The sand grains in sand dunes serve as archives of the desert's evolutionary history, providing insights into climatic changes. However, decoding these records is complex due to the polycyclic nature of aeolian processes. The Thar Desert in India holds both geological and archaeological significance, but its origin and evolution are debated. Some researchers argue for a local sediment source, while others suggest distant sources like the Indus River. This study uses petrographic and geochemical analyses to explore the Thar Desert's landscape development. Dune morphology and grain size analysis indicate that the South-West Summer Monsoon has played a critical role in sediment transportation, highlighting the importance of regional wind patterns. Published dates show significant expansion and contraction of the desert in response to the Pleistocene climate variablity. Understanding the desert's evolution requires recognizing its sediment provenance. U-Pb dating of detrital zircons was employed to trace the sediments' origins. The findings reveal a complex sediment provenance, including fluvial inputs from regional systems like the Sutlej and Yamuna rivers, local contributions from the underlying Marwar Supergroup, and distant sedimentary influx from the Indus River. This indicates a heterogeneous mix of source materials. Spatial analysis shows that the relative contributions of local and distant sediments vary across different regions of the desert, providing insights into the processes shaping the Thar Desert. This highlights the interplay between climate, sediment transport, and geological features.

Abstract ID: 061657

REGENERATION OF MANGROVE PATCHES IN FRINGE OF SUNDARBAN CORE FOREST AREA

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Sundarbans is one of the largest deltas in the world. This Forest is located on the shores of the Bay of Bengal. The current area of this forest is 10277 sq. km (including water), of which 4260 sq. km is in India and 6017 sq. km in Bangladesh (JISCAR-2013). It borders the Sundarbans, a UNESCO World Heritage Site of India carved out in 1987. This study investigates the regeneration of mangrove patches in the Indian Sundarbans, focusing on the Namkhana, Mathurapur-II, Mathurapur-I, and Canning-II blocks of South 24 Parganas district. Utilizing remote sensing and GIS techniques, the study analyzes temporal dynamics of mangrove health using indices such as NDVI, SAVI, VCI, and BSI over a period from 2010 to 2024. The study revealed an overall improvement in plant health and mangrove cover, attributed to natural regeneration and conservation efforts. The findings indicate significant spatial variation in mangrove health, with some areas showing robust regrowth while others remain degraded. The use of satellite imagery offers valuable insights into the effectiveness of ongoing restoration projects, highlighting areas that require further attention. This study contributes to the broader understanding of mangrove ecosystem dynamics and the critical role these forests play in coastal protection and biodiversity conservation.

Abstract ID: 073430

STABILIZATION OF RIVERBANKS USING BAMBOO LOGS: IS THIS AN IDEAL SOLUTION FOR THE SUNDARBANS, INDIA?

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In the deltaic region of the Sundarbans, India, human settlements have traditionally relied on constructing embankments along riverbanks to prevent flooding in inhabited areas. These embankments often experience toe undercutting due to swirling currents, tidal surges, and strong winds, which eventually leads to their failure. To mitigate erosion, bamboo logs are commonly used to cover the embankment face, as bamboo is locally abundant and cost-effective. However, field investigations reveal that the use of bamboo logs for embankment stabilization has not been an effective solution in the Sundarbans. This study seeks to understand why bamboo logs fail to provide a long-term solution for stabilizing riverbanks in this region. The research focuses on analyzing the turbulent flow characteristics near the bamboo log and sediment bank interface. To explore this, laboratory flume experiments were conducted using jute sticks as a scaled representation of bamboo logs. Turbulent 3D velocity measurements were taken around the logs to better understand how bamboo influences the flow and affects the embankment. The findings indicate that while bamboo logs initially slow down erosion and provide some protection, they eventually separate from the bank face as erosion progresses. Each log creates a significant wake region, increasing turbulence and shear stresses, which, in turn, accelerates the erosion process more in unprotected areas.

Abstract ID: 083017

Effect of Wave Action on Grain Size Distribution of Non-Uniform Bed Sediments on an Adverse Slope

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Coastal and riverine systems are shaped by sediment transport, which influences landscapes and habitats. This study examines how wave energy interacts with bimodal sand beds characterized by two distinct grain sizes using a laboratory flume experiment. The focus was on understanding bed evolution, sediment transport rates, and bedform dynamics under different wave conditions.

Results showed that coarse and fine sediments exhibit different transport behaviors under wave action. Coarse grains accumulate in wave troughs, forming larger bedforms, while fine grains are more easily suspended and transported. The grain size distribution transitions from bimodal to unimodal as the bed changes from planar to sloping. Skewness in grain size distribution (third moment) serves as an indicator of transport mode and energy conditions, with beach sands often displaying a negative skew due to wave sorting. These findings enhance our understanding of sediment dynamics in natural settings like river mouths and coastal areas, where bimodal sand beds are common. The insights gained are valuable for improving morphodynamic models and advancing coastal engineering practices by providing a clearer picture of interactions between wave hydrodynamics and sediment morphology.

Abstract ID: 103349

SEASONAL AND STORM EVENT-BASED WATER QUALITY ASSESSMENT OF SHALLOW OXBOWS IN THE JALDHAKA FLOODPLAIN, INDIA

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In floodplain landscapes, shallow oxbows are significant aquatic-terrestrial ecosystems and socioeconomic entities for the residential communities around them. The water level fluctuations in these oxbow lakes and their connections with the nearby river during flood events, determine available ecosystem services such as water-land provision and also influence the ambient water quality for organisms and communities. As a large section of the population in developing nations reside in floodplains, the water quantity and quality of floodplain oxbows are adversely affected by the requirement for arable land and settlements, road connectivity between settlements, human use and flood prevention measures. Oxbow lakes of the Jaldhaka River floodplain in India are examined in this study. The objectives are to evaluate the seasonality of their water's physio-chemical parameters and to assess flood event effects on water quality in terms of surface water connectivity with rivers and local catchments. Principal component analysis and factor analysis are used to evaluate the overall surface water quality while reducing the subjectivity for choosing water quality parameters through a modified Horton's Water Quality Index in light of local hydro-morphological significance and human use. Additionally, storm event sampling was done to evaluate how flood events affect the physiochemical water characteristics in oxbows. The results of this study indicate that the primary determinants of oxbow water quality are the source of water supply, within-oxbow activity, flooding frequency, seasonal nature of wet and dry phases, and human use along the oxbow margins.

Abstract ID: 110534

EXAMINING SAND MINING INDUCED ANTHROPOGENIC LANDFORMS AND THEIR IMPACTS ON WATER QUALITY ON SELECT RIVERS IN THE RARH REGION OF WEST BENGAL USING IN-SITU AND REMOTELY SENSED DATA

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Many rivers in India are under extreme threat due to a number of human activities and illegal encroachment within the floodplains. Indiscriminate sand mining has markedly deteriorated the overall river health including water quality and has generated a new class of landforms that forms entirely from mining activities. Mining affected reaches along the selected rivers of Rarh Bengal were studied and the mining induced landforms were classified based on whether they were created by excavation (sand bar skimming and scooping), planation (sand bar levelling) or accumulation (sand piling) processes. Multi-temporal high-resolution satellite images were used to map the seasonal and yearly variations in patterns and growth of these features, revealing how their character alters from the start of the post-monsoon sand mining season to its end just before the next summer monsoon. The suspended sediment concentration (SSC) were estimated for the mining affected reaches using different indices and parameters such as NDSSI, NSMI, NDTI and TSS (mg/l) from multi-year and multi-seasonal Sentinel-2A images via Google Earth Engine platform. Field measurements of water quality parameters using a depth-wise YSI ProDSS sampler were undertaken to validate the results of remotely sensed data through statistical correlations. The suspended sediment concentration are expectedly higher in the active sand mining reaches, with extremely high turbidity levels within recently dug-out sand pools. Field measurements showed lower dissolved oxygen (mg/l) levels in these reaches, all these results in the death of fishes and reduced macroinvertebrate diversity.

MORPHODYNAMICS AND SORTING PATTERNS IN MIXED-SEDIMENT SLOPING BEDS: AN EXPERIMENTAL STUDY

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Anthropogenic interventions in riverine systems significantly impact their hydrodynamic and ecological integrity, leading to siltation, bank instability, and altered sediment dynamics. Cross-drainage structures on perennial rivers modify flow energetics, causing irregular changes in sediment characteristics and bed roughness. While experimental studies on size sorting in non-cohesive sediment beds exist, comprehensive understanding of heterogeneous sediment movement on sloping beds remains limited, particularly relevant in the Anthropocene era. This research investigates bed morphology evolution through laboratory flume experiments using mixed sediment compositions (fine sand, coarse sand, and gravel) on a 5° slope under unidirectional flow. The study employs micro-ADV for velocity measurements, underwater videography for particle motion analysis, and digital vernier gauge for bed morphology assessment. The methodology focuses on temporal bed modifications until quasi-equilibrium state and examines relationships between near-bed turbulence and sediment transport. Results demonstrate that sediment bed non-uniformity significantly influences stability, showing strong correlations with flow variables. Flow turbulence modifications along the slope enhanced non-uniform flow conditions, generating primary bed structures with distinct grain size distribution patterns. This investigation provides insights into the relationship between sediment bed characteristics and spatiotemporal modifications under unidirectional flow, contributing to improved engineering solutions for siltation management at hydraulic structures.

Abstract ID: 105908

MAPPING THE LOST CHANNELS: A MULTIPROXY APPROACH TO UNCOVER THE DAMODAR RIVER'S PAST

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The Damodar River holds profound historical and societal significance in Rarh Bengal, eastern India. It originates from the Chotonagpur plateau and flows eastward to its present confluence with the Hooghly River. The river has undergone multiple large-scale shifts in its course, creating an extensive inland para-delta system. This study aims to delineate the major paleo-channel of the Damodar River using historical records, remote sensing, geophysical surveys, and field investigations.

Historical evidence of a significant shift in the Damodar's course is apparent from medieval literatures, particularly the 'Manasa Mangal,' which indicates that the river's main channel was different from its current one. In this study, satellite imagery is used to identify the presence of multiple paleo-channels, while field investigations and geophysical surveys on one of the dominant paleo-channels reveal sedimentary facies associations that can be classified as a major paleo-channel. Interestingly, multiple Vertical Electrical Resistivity surveys indicate that the paleo-channel contains coarse sand bodies extending to tens of meters in depth, demonstrating the significance of this paleo-channel of the Damodar River. These evidences indicate that the Damodar River has shifted its major course in the recent past only. This study also indicates high groundwater recharge potentiality of this palaeo-channel system of the study area. Therefore, this research sheds light on the river's interplay with the hydrological system and its influence on human settlement in the region.

Abstract ID: 113141

UNRAVELLING UNDEREXAMINED FOREST FIRE DYNAMICS AND THEIR IMPACT ON SOIL PROPERTIES IN THE DRY DECIDUOUS FORESTS OF THE RARH REGION, INDIA

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This study delves into the underexamined yet pressing issue of forest fires in India, focusing on southern West Bengal's dry deciduous forests. While regions like Uttarakhand receive significant attention due to their extensive forest cover and high fire incidence, and therefore hold a substantial share of national forest fire incidents, fires in states with relatively small and fragmented forested areas, such as West Bengal, are frequently underestimated. By employing Location Quotient (LQ) analysis, we reveal critical insights into the spread and number of fire incidents. Results reveal that forested areas in West Bengal experience disproportionately high fire frequency relative to their forest cover. This makes West Bengal's dry deciduous forests highly vulnerable to being wiped out and left as altered soils. To validate whether fire-induced soil alteration can occur, further investigations were undertaken in three different forest patches in southern West Bengal, examining the alterations in soil physicochemical characteristics following fire events. Samples from burnt and unburnt patches were compared at three depths (0–5 cm, 5–10 cm, and 10–20 cm), during the 2024 fire season. Substantial post-fire changes were observed in the burnt forest areas in terms of soil pH, electrical conductivity, organic carbon, nitrogen, potassium oxide, and bulk density, especially at the 0–5 cm depth, likely due to ash deposition and incomplete combustion of organic matter.

Abstract ID: 112535

GEOMORPHOSITE MAPPING AND GEODIVERSITY ANALYSIS USING STRUCTURE-FROM-MOTION METHODS FOR GEOHERITAGE CONSERVATION

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Mapping of geomorphosites is important to create an inventory of such locations having outstanding geological and geomorphological attributes that harbour significant scientific, educational and cultural value. Alongside this, the enumeration of the geodiversity richness of a region is necessary so that the most important portions can be conserved and frameworks developed to mitigate anthropogenic impacts. This study assess the health status of several geomorphosites in southern West Bengal and adjoining areas, using a recently-developed coding system to denote their attributes. The geodiversity computations are done based on the richness of geological, geomorphological, hydrological and pedological attributes present across the region, enumerated using a grid based approach and employing standard formulae. The novel structure-from-motion close-range photogrammetric method is used to automatically process overlapping and stereo images taken of these geomorphosites and advanced image processing algorithms are used to generate interactive 3-D models of these locations. Such models, captured over multiple time periods can also reveal in great detail the landscape changes that have occurred. The creation of such 3-D models further enables wider user interaction when hosted onto digital platforms and ensures the wider dissemination of knowledge about the geological diversity and geomorphic attributes, which are necessary for generating geotourism and enabling geoconservation. The SEA (Science-Education-Aesthetics) model is finally employed to assess proper management strategies of such geomorphosites, which is pertinent given the Draft Geoheritage Conservation Guidelines and Act being framed by the Government of India.

Abstract ID: 010227

LEVERAGING GEOSPATIAL TECHNIQUES AND MACHINE LEARNING TO EXPLORE AND PREDICT THE IMPACT OF RISING LAND SURFACE TEMPERATURE ON CROP GROWTH AND AGRICULTURAL SUSTAINABILITY: A CASE STUDY OF NADIA DISTRICT.

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The recent years has witnessed a noticeable rise in the land surface temperature (LST), due the current trends of climate change. This has had a direct impact on the agricultural productivity and crop growth pattern. In this context, geospatial techniques, machine learning and cloud computing technologies have been employed to explore and predict the changing agricultural pattern using the case study of Nadia district. Remotely sensed data has been used to get insight into the increasing LST and calculate the Normalized Difference Vegetation Index (NDVI) for the analysis. Machine Learning has been used to predict the future implication of the upward trend in temperature, on the agricultural productivity using Cellular Automata and Markov Chain (CA-MC) model, to understand the spatial pattern of crop growth and its temporal change. It has been analyzed that the rising temperature has had a positive impact on the crop growth as indicated from the low NDVI values acquired. Rice is the dominant crop cultivated in Nadia district and a drop in its productivity has been noticed in the recent years. Since, about ~70% of the rural population of the district relies on agriculture for their livelihood, it calls for urgent need to promote sustainable and climate smart agricultural practices in the district to improve the livelihood of the people and assure food security not just for the present population but for the future as well.

Abstract ID: 043426

ROCK-MAGNETIC ANALYSES FROM A SELECTED SECTION OF THE PRECAMBRIAN BASEMENT ROCKS IN AND AROUND KALYANESWARI-MAITHON AREA, WEST BENGAL AND JHARKHAND, INDIA.

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In the high-grade Precambrian basement rocks of the Kalyaneswari-Maithon area, the occurrence and abundance of Fe-Ti oxide minerals are influenced by the rock composition and the stable mineral phases formed under metamorphic pressures and temperatures. Microscopic analysis of polished thin sections reveal the textural relationships across various sampling sites identifies at least two distinct generations of ferromagnetic mineral assemblages. The earlier generation consists of medium-sized, irregular grains of homogeneous titanomagnetite and the second generation includes titanomagnetite grains with exsolved lamellae of ilmenite, suggesting a subsequent thermo-tectonic event. This later phase of magnetic oxide is specific to the studied area's rocks.

The petrographic analysis of rocks highlights a substantial presence of Fe-Ti oxides, a finding corroborated by various rock magnetic measurements. Curie curves illustrate the thermal behavior of magnetic minerals, with hematite displaying characteristic paramagnetic properties and magnetite exhibiting ferromagnetic behavior up to its Curie temperature. Hysteresis curves further confirm the presence of these minerals, with magnetite showing a complete loop indicative of strong ferromagnetism, while hematite exhibits unsaturated curves typical of paramagnetic minerals. Isothermal Remanent Magnetization (IRM) curves reinforce the prevalence of magnetite in the studied rock samples experiments demonstrate that upon application of a magnetic field, the samples achieve saturation magnetization, a trait consistent with the ferromagnetic properties of magnetite. These collective findings underscore the significant role of magnetite and hematite in the magnetic mineralogy of the rocks from Kalyaneswari-Maithon area, suggesting complex geological processes and metamorphic histories that have influenced their magnetic properties over time.

Abstract ID: 104925

QUANTIFICATION OF GROUNDWATER QUALITY ISSUES IN REFERENCE TO THE URBANIZATION IN PARTS OF BARDDHAMAN DISTRICT, WEST BENGAL

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The Bardhhaman district, located in the western-central part of the Bengal basin, is characterised by significant shifts in functional land use over time. This has led to a region wide intersection of urban development and environmental impact. Geologically it represents a transition zone from the Chotanagpur Plateau at the west to the Gangetic alluvial plain at the east, complicating its hydrological dynamics. A focused examination of hydrochemical facies conducted from 2013-14 to 2021-22 has revealed the consequences of rapid urbanisation on groundwater regimes. This analysis implies methods like Water Quality Index (WQI) and remote sensing indices to assess changes in water quality and availability. Accompanying satellite imagery, the extent of urban expansion and its direct implications on groundwater resources are illustrated. The swift urbanisation of Bardhhaman has not only reduced the natural rates of groundwater recharge but also intensified extraction processes, leading to significant alterations in hydrochemical facies, which are further exacerbated by pollution from anthropogenic activities, ultimately resulting in the degradation of groundwater quality.

Keyword: Hydrochemical Facies; Remote sensing; Water Quality Index

Abstract ID: 113901

COMPARATIVE ANALYSIS OF BENTHIC FORAMINIFERA IN SURFACE AND SUBSURFACE SAMPLES FROM BAKKHALI, INDIAN SUNDERBANS

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The hard mineralized tests of foraminifera are highly sensitive to environmental changes like temperature, salinity, turbidity, and pH; making them valuable biological proxies for paleoclimate reconstructions. Studies reveal diverse environmental gradients along the Bay of Bengal coast, which influence foraminiferal distribution and abundance. This report offers a comparative analysis of foraminiferal assemblages, species diversity and abundance in surface and subsurface samples from the Bakkhali region. Surface samples were collected from Patibhunia, Fraserganj, Bakkhali, and Henry's Island (21°34' N to 21°35' N and 88°14' E to 88°18' E), while subsurface samples were obtained from the marsh areas of Patibhunia (21°34' 54.332 ' N, 88°15' 7.742' E) and Henry's Island (21°34' 25.052 ' N, 88°18' 0.602 ' E). Identified calcareous species in both surface and subsurface samples include *Ammonia beccarii, Ammonia tepida, Cribroelphidium hispidulum, Haynesina depressula* and *Haynesina germanica*. Agglutinated forms in surface samples comprise *Ammodiscus evolutus, Ammotium agglutinas, Haplophragmoides wilberti, Miliammina fusca* and *Trochammina inflata*, while only *Trochammina inflata* and *Haplophragmoides wilberti* were found in subsurface samples. Pre-monsoon abundance is higher due to favourable conditions of salinity, temperature, nutrient availability, and dissolved oxygen, aligning with the reproductive season. Murray's Ternary Diagram indicates dominance of calcareous hyaline forms, while Fisher's alpha index shows overall low species diversity (α=1-2) in both sample types. Subsurface samples show one or more downcore maxima of living benthic forms reflecting favourable environmental conditions. Varying species richness and foraminiferal abundance is found from west to eastern part of the study region due to stressed environment, shifting of environmental settings and several anthropogenic activities.

AGRICULTURE, HORTICULTURE, FISHERIES AND VETERINARY SCIENCES

Abstract ID: 125816

NEWER BRACKISHWATER AQUACULTURE PRACTICES INTRODUCED IN SOUTH 24 PARGANAS AS ALTERNATIVE TO*PENAEUS MONODON* AND *LITOPENAEUS VANNAMEI* FARMING - TOWARDS SUSTAINABLE INCOME GENERATION OF FISH FARMERS IN SUNDARBANS REGION

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Tiger shrimp *Penaeus monodon* farming was mainstay of commercial brackishwater aquaculture in South 24 Parganas. Incidences of severe viral diseases in it forced farmers to adopt farming of another economically-important shrimp *Litopenaeus vannamei*. Its slow growth and mortality was evident due to incidences of White Faeces Syndrome, parasite EHP and *Vibrio* sp infection. Recently brackishwater fish farmers spoke about significantly lowered profit in shrimp farming which is highly aquaproduct-dependent. In last decade, small- and medium-scale brackishwater farmers and youths in remote villages in Sundarbans have adopted farming of *Liza parsia*, *Liza macrolepis*, *Liza tade*, *Mystusgulio*, *Latescalcarifer*, 'all-male' *Tilapia nilotica*, ornamental fishes *Scatophagus argus*, *Etroplus suratensis*, prawn *Macrobrachium rosenbergii*, crab *Scylla serrata*, *Scylla olivacea* (also fattening) in tide-fed well-maintained brackishwater ponds. Farm-made supplementary feed provided to growing fishes and shellfishes; riverine seeds stocked except *T. nilotica*. These marketable-sized fishes at harvest have good nutrient content, beneficial for human health, palatable, less intramuscular spines, high consumer preference, market demand and export potential. Indigenous knowledge, skill, ingenuity and scientific packages of practices are applied by farmers; these practices have become newer avenues of livelihood and created self-employment opportunities. Experiences and knowledge gained from progressive elderly fish farmers will be presented.

Abstract ID: 093404

SUCCESSFUL PRACTICE OF MARIGOLD CULTURE AND PRODUCTION COMMERCIALLY IN MODIFIED-EXTENSIVE METHOD – MY EXPERIENCE

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Khirai region under Panskura Block, Purba Medinipur is known as 'Valley of Flowers'; year-round culture of bright orange and 'Basanti' yellow marigold developed successfully in few villages under this Block in social harmony. I gained practical knowledge on this vocation while working in two marigold plots, 13dec each, at father's home in Kharu-Radhanagar village, Ghoshpur GP near Khirai. Marigold seedlings (5-6cm) and stem cuttings 12cm used for planting in separate time of year, former bought @ Rs 200-250/-/1000nos; total 5000nos required for each plot. Marketable-sized flowers harvested from 65^{th}-70^{th} day of planting from 0.45-0.75m tall plants - it is from 45^{th} day when stem cuttings used. Plucking (harvesting) done for continuing 90-105 days period. Chemicals used judiciously to prevent black spots on flower, retain bright colour. Neem oil, neem oil cake and traps used against insect pests. Total 20 strings of marigold, each 0.9m long holding 30-35 flowers, constitute one 'Kuri' with 600-650 flowers. Initially, 6-7 Kuri prepared from loose flowers harvested every week from each plot. It increases to 40-45 Kuri every week after 18-20 days onwards of $1^{st}/2^{nd}$ harvest. Marigold sold @ Rs 30-50/-/Kuri when more production, less demand - increases to Rs 150-250/-/Kuri when demand is maximum. Unlike rose and tuberose, time between planting and harvesting marigold is less, advantageous for floriculturists, fetches good price - dependable and prospectful avenue of income.

Abstract ID:090056

SUSTAINABLE AGRICULTURE AND CLIMATE RESILIENCE: THE ROLE OF PESTICIDE RESIDUE MITIGATION

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Climate change highly influences the agricultural practice as it changes pest dynamics, crop yields, and persistence of pesticide residues. This paper appeals to have control over the pesticidal use and ensure increased climate resilience while shielding human health and the environment from harm. To this effect, the paper emphasizes key regulations; Good Practice Labels (GPL), Acceptable Daily Intake (ADI), Maximum Residue Limits (MRL), Re-entry Periods, and Residual Analysis. These provide the basis for safe applications of pesticides. Findings indicate that chemically intensive farming systems, such as the Curtis model, and regions with past reckless pesticide use record higher levels of residual pesticide activity. This leads to higher environmental contamination and potential risks to human health. Sustainable measures like organic farming, Integrated Pest Management (IPM), Integrated Disease Management (IDM), Integrated Weed Management (IWM), and Agroecosystem Analysis tends to decrease the pesticidal residues and favour ecological balance. Still there are many challenges that persist, especially in terms of farmers' education and economic limitations along many regions. Inadequate access to safe pesticide use and alternative pest management strategies affects most farmers and later prevents the adoption of environmentally friendly best practices. Economic challenges, therefore, deeply magnify this. Through education of the farmers themselves and sustainability technologies for farming, the potential of improving the resilience of agricultural systems against climate change can be enhanced while concurrently ensuring food and environmental security. Above all, the study calls for continuous imperative climate research, technological investment, and adaptation management to overcome the challenges.

Abstract ID: 050719

AMELIORATING EFFICACY OF SUPPLEMENTING DIETARY NANO-ZINC VIS A VIS VITAMIN E ON LEAD-INDUCED STRESS IN ROHU (*LABEO ROHITA*)

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Stress is unavoidable yet most challenging issue for aquatic animals which often leads to the retardation of growth, production, and health of individuals. The present study investigated the oxidative stress-relieving efficacy of nano-Zn and vit-E in a fish model. In the first phase to determine the LC_{50} of lead (II) nitrate [$Pb(NO_3)_2$] the experimental fishes (*L. rohita*) were exposed to 5 different concentrations of $Pb(NO_3)_2$ for 96 hours, and mortality was recorded over time. The Probit analysis determined the LC_{50} value at 37.82 mg/L. In the next phase, a 90-day long *invivo* feeding trial was conducted where 630 fish were randomly allocated into 7 dietary treatments, each having 3 replicates. The fishes (except the Positive Control) were exposed to the $1/50^{th}$ of 96h LC_{50} dose of $Pb(NO3)_2$ [i.e. 0.756 mg/L] throughout the trial period. A significant growth depression was observed among the fishes of Positive Control group, that were exposed to $Pb(NO_3)_2$ throughout the study. However, the Pb-induced stress was less pronounced in other treatment groups, suggesting the antioxidant defence of nano-Zn and vitamin E. No synergistic advantage was observed when nano-Zn was supplemented in combination with vit-E. Histopathological studies and biochemical assay revealed a higher ameliorative efficacy of Vit-E over nano-Zn for combatting the Pb-induced stress. So, we can recommend for supplementation of vitamin E @ 200 IU to minimize the consequences of Pb-induced stress in *Labeo rohita*.

Abstract ID: 082133

SUPPLEMENTAL DIETARY NANO-ZINC CAN IMPROVE THE PRODUCTION PERFORMANCES AND MODULATE THE ANTIOXIDANT AND ANTIVIRAL GENE EXPRESSION IN *CHANOS CHANOS*

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In recent days nanotechnology has emerged to reshape the science of nutrition. Feeding of different nano-nutrients not only ensures its abundance at cellular level but also optimizes the production system. We have synthesized a unique variety of nano-Zn to be used as a dietary supplement for fish. After confirming its nano size by microanalytical characterization, the as-synthesized nano-Zn was fortified in the diet of a commercially important brakishwater fish (*Chanos chanos*) to evaluate its efficacy in respect to its inorganic and organic counterparts. After a 120 days long *in vivo* feeding trial, supplementation of nano-Zn proved to have a marked influence on the growth and feed conversion efficiency. The fish fed with nano-supplement found to have a healthy gut and higher survival rate. Fish fed with nano-Zn exhibited higher antioxidant status in respect to other treatment groups. The mineral profiling of the fish body revealed the accumulation of some critical minerals zinc and iron. The Gene Expression Study established the potency of our synthesized nano-Zn in comparison to its other counterparts. The present study revealed the upregulation of Cu-Zn SOD, Catalase and IRF3 gene expression among the fish body that were fed nano-Zn fortified diet. The 3-D protein structure of IRF3 revealed four Zn-binding sites present in IRF3 Gene and interpretates the possible activation due to high bioavailability of nano form of zinc. The present set of investigations established the role of our synthesized nano-zinc to be used as a 'new generation' feed additive for commercial fish production and health.

Abstract ID: 114450

MOLECULAR DETECTION OF *LISTERIA MONOCYTOGENES* AND *L. INNOCUA* ISOLATES IN FISH SKIN SWAB FROM RETAIL FISH MARKETS IN WEST BENGAL, INDIA

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Listeria monocytogenes is considered to be a ubiquitous zoonotic pathogen, which is also from contaminated fish and fishery products in different parts of the world and India is no exception. Although *L. innocua* is considered non-pathogenic, rare sporadic occurrence of pathogenicity reported recently. In the present study, a total of 234 swab samples collected from skin of fresh water fish rohu (*Labeo rohita*) from retail fish markets of Kolkata (n=165) and South 24 Parganas (n=69) districts of West Bengal for the detection of *L. monocytogenes* and *L. innocua*by standard microbiological and molecular methods with species-specific polymerase chain reaction (PCR). A total of 104 (44.44%) isolates were identified as *Listeria* sp. by cultural characteristics, biochemical tests and *Listeria* genus specific *prs* gene PCR, of which 6 (2.56%) and 11 (4.7%) isolates were detected as *L. monocytogenes* and *L. innocua* by species-specific PCR targeting *lmo1030* and *lin0464* gene, respectively. All *L. monocytogenes* isolates belonged to IVb serogroup as per Doumith scheme. Occurrence of *L.monocytogene s*appeared low in the present study. However, it is necessary to implement a regular monitoring system to test quality of Indian food maintaining food safety standards.

Abstract ID : 084019

DETECTION AND ASSESSMENT OF VIRULENT *STAPHYLOCOCCUS PSEUDINTERMEDIUS* FROM DOGS IN AND AROUND KOLKATA WITH THEIR ANTIBIOGRAM

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Staphylococcal infections are prevalent in both veterinary and human medicine. *Staphylococcus* sp. is a spherical, gram-positive bacterium that commonly exists as a commensal organism. In this study, dog samples from different body sites were included out of which 67.25% (191/284) samples were positive for *Staphylococcus* sp., and 58.45% (166/284) were detected as coagulase-positive *Staphylococcus* sp. The overall prevalence of *Staphylococcus pseudintermedius* was 36.26% (103/284), out of which 40.35% (23/57) from Golden Retriever, 52.08% (25/48) from Labrador retriever, 27.65% (13/47) from Beagle, 22.85% (8/35) from Spitz, 35.13% (13/37) from German Shephard and 35% (21/60) from non-descriptive breeds (Table 3(a)). The study showed a higher prevalence of *Staphylococcus pseudintermedius* in Labrador Retriever and Golden Retrievers *i.e.*, 52.08% and 40.35% respectively followed by German shepherd (35.13%), non-descriptive (35%), Beagle (27.65%) and Spitz (22.85%). Out of a total of 166 COPS strains, *S. pseudintermedius* was isolated from 65.27% (94/144) of dogs exhibiting clinical symptoms and from 40.90% (9/22) of dogs without apparent health issues. The methicillin resistance gene (*mecA*) gene was identified in *S. pseudintermedius* with a percentage of 77.66% and the tetracycline resistance gene (*tetK*) gene was identified with a percentage of 22.33%. All isolated strains of *S. pseudintermedius* were screened for the presence of biofilm-producing genes—namely, *icaA* & *icaD* with rates of 88.34% and 90.29% respectively. On testing, *Staphylococcus pseudintermedius*isolates showed a higher rate of antibiotic resistance against beta-lactams and the cephalosporin group of antibiotics. This study showed the correlation between biofilm production and antibiotic resistance properties.

Abstract ID: 112248

DEVELOPMENT OF ORGANIC ACID TREATED SAL STARCH AS A POTENTIAL FAT REPLACER FOR REDUCTION OF HYPERCHOLESTEROLEMIA

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Sal starch has been used as a fat replacement because it is a natural, plentiful, biocompatible, biodegradable, and inexpensive biopolymer. The application of this valuable biopolymer in the food sector has been constrained, nevertheless, due to some limitations of native sal starch, including its low thermal resistance, high tendency to retrogradation and syneresis, low peak viscosity, and stretchy weak body gels. It makes sense that acid hydrolysis might be a good method for modifying sal starch to use as a fat substitute in O/W emulsions. The main goal of the current investigation was to determine how citric acid modifications affected the structural, functional, and physicochemical characteristics of sal starch, as well as to investigate the effects of incorporating developed fat substitute on a hypercholesterolemic mice model. Starches were extracted via alkaline extraction method and were subjected to acid hydrolysis at 5% concentrations. An *in-vivo* hypercholesterolemic model was being developed using C57BL/6 to investigate the effect of chemically modified starch.Sal starch the compared to unmodified starch which was shown to 0.87(g/g). X-ray diffraction study showed that modified and unmodified mango starch exhibit A-type crystalline structures with different crystallinity. Hypercholesterolemia induced mice (TC-281.90mg/dl, TG-160mg/dl, HDL-27.16mg/dl, LDL-129.54mg/dl) fed chemically modified starch showed significant decrease in TC-132mg/dl, TG-86mg/dl, HDL-23.86mg/dl, LDL-90.94mg/dl. Given the results, it may be proposed that sal starch treated with organic acid is a suitable fat substitute with possible cholesterol-lowering properties because it produced equivalent spreadability, consistency, elasticity, and yield stress, as well as good stability of the reduced-fat emulsions.

Abstract ID : 015543

DESIGN AND DEVELOPMENT OF PROTOTYPE FOR LEVERAGING AI AND HIGH-THROUGHPUT PHENOTYPING FOR SUSTAINABLE AGRICULTURE

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Addressing global food security and sustainable agriculture challenges requires innovative approaches to crop improvement. Plant phenotyping involves obtaining observable characteristics or traits influenced by both genotypes and environmental conditions, emerging from the dynamic interaction between a plant's genetic makeup and its surrounding environment. This present study mainly designs and develop a prototype i.e an autonomous robot integrating high-throughput phenotyping technologies (HTPT) with artificial intelligence (AI) and machine learning algorithms to transform plant breeding. Our system can rapidly measure a significant number of plant morphological, physiological, and chemical parameters, while the integration of AI and robotics enables real-time monitoring in complex field and controlled environments. This approach not only allows for the discovery of intricate patterns and correlations between traits and genetic factors but also streamlines trait selection, reducing the time and cost of developing new crop varieties. This prototype supports efficient data analysis and predictive modeling. Further funding is essential to advance the prototype, overcome existing challenges, and fully unlock the potential of HTPT and AI for sustainable agriculture.

Abstract ID: 115817

A PATH TOWARD CHEMICAL FERTILIZER FREE RICE FARMING : UTILIZATION OF NANOIRON-LOADED ALGAL EXTRACT AS SEED PRIMING AGENT

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The use of sustainable agricultural practices is essential to reduce dependency on chemical fertilizers and enhance crop productivity. Iron nanoparticles and algal extracts have individually been explored as seed priming agents in recent years, showing positive effects on plant growth and yield. This study presents an innovative approach by combining these two agents through a green synthesis process, using iron nanoparticle-loaded algal (*Ulva intesatinalis*) extract as a seed priming agent to achieve enhanced outcomes in rice cultivation. Five different priming treatments were evaluated: (1) hydro-priming (control), (2) $FeSO_4$ solution priming, (3) iron-nanoparticle priming, (4) algal extract priming, and (5) iron nanoparticle-loaded algal extract priming. Physiological parameters such as germination percentage, vigor index, relative water uptake, enzyme activities (amylase and protease), and iron content improved across all treatments compared to the control, with Set 5 showing the highest performance. After germination, seeds were planted in two types of soil: with and without chemical fertilizers. Growth parameters, including shoot and root length, chlorophyll content, tiller number, panicle number, grain yield, and straw yield, significantly improved in Sets 2, 3, 4, and 5 under both soil conditions. Notably, Set 5 (iron nanoparticle-loaded algal extract priming) without fertilizer produced results comparable to Set 1 (hydro priming) with fertilizer, highlighting its potential as an eco-friendly alternative to conventional farming practices. Field trials further validated the efficacy of Set 5, suggesting that algae-based nanoparticle priming can reduce fertilizer dependence while maintaining crop productivity. This innovative approach offers a sustainable pathway toward chemical-free agriculture for future.

Abstract ID : 122906

SEASONAL RAINWATER TESTING AND CHANGES IN SOIL PROPERTIES FOR IMPROVE CROP CULTIVATION IN WEST BENGAL

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Rainwater harvesting is a crucial element in sustainable agricultural practices, especially in regions like West Bengal, where seasonal rainfall plays a significant role in crop cultivation. This study investigates the chemical and physical properties of seasonal rainwater and their subsequent effects on soil characteristics in selected agricultural regions of West Bengal. By testing rainwater samples during monsoon and pre-monsoon seasons, we assess parameters such as pH, dissolved nutrients, and contaminants. Parallelly, changes in soil properties such as pH, organic matter content, and nutrient availability are analyzed before and after rainwater exposure. The aim is to determine how seasonal rainwater contributes to soil health and its impact on improving crop yield and sustainability. Our findings show that the interaction between rainwater and soil significantly influences soil pH, nutrient content, and microbial activity, offering insights into optimizing rainwater management to enhance agricultural productivity in West Bengal. The research also provides practical recommendations for farmers to modify soil treatment based on seasonal water quality, ultimately aiming to improve crop cultivation practices in the region.

Abstract ID : 091311

MICROPLASTIC CONTAMINATION IN CROPS GROWN THROUGH GARBAGE FARMING: A CASE STUDY ON DHAPA, KOLKATA, INDIA

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The dependency of human-beings on plastics and its commodities has been inseparable from decades because of their easiness. The accumulation of these plastics in environment over years has led to various consequences. Nonetheless, polymers accumulated in environment undergo incomplete degradation forming smaller fragments referred as microplastics (MPs). Studies revealed plants absorb polymer fragments–correlating contamination, emphasizing the urgency to know our food for effective mitigation. Therefore, this study aims to assess polymer-contamination in vegetables grown through garbage farming in Dhapa, Kolkata. Study has been conducted on eggplant (*Solanum melongena Linn.*), spinach (*Spinacia oleracea Linn.*), tomato (*Solanum lycopersicum cv. Micro-Tom*), cabbage (*Brassica oleracea var. capitata Linn.*) and chili (*Capsicum annuum var. Candlelight Linn.*). Methodologies employed in isolation of MPs focused on organic matter degradation and concentrating undigested solids. Characterization of isolated pallet accomplished by identification of excitation and absorbance range of particles using fluorescence-microscopy and UV-Visible absorption-spectroscopy respectively. Additionally, chemical characterization achieved using FT-IR Spectroscopy. Morphological studies carried out using SEM and DLS for size determination. This study revealed that numbers of MPs identified were ranging from 3-5 MPs/g dried-vegetable mass, while 8-13 MPs/g were identified in dried-soil. Out of which polyethylene is the major contaminant, exposing polypropylene as the second. The size of plastics identified in soil varied from 1.6-10137µm while vegetables had fragments ranging from 1.72-2.83µm. Chili was the most-contaminated vegetable while spinach was the least contaminated. Considering the results, it is suggested to segregate degradable materials from plastic wastes for long-term effectiveness when using garbage waste for forming.

Abstract ID : 092307

SOME SOIL COMPONENTS AND FACTORS CAN ABLE TO MITIGATE CLIMATE CHANGE.

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In this work an evaluation was done on carbon sequestration index for find out any relationship with climate change. Forty different types of soil samples were collected from forest, deforest, pasture and agricultural fields of different agro-climatic zones of India. Soil chemical analysis and various types of carbon stocks are estimated from these soils and characterizes by chemical and instrumental analysis. E_4/E_6 value increases whereas cation exchange capacity reduces with deforested and in agricultural land. On analysis it was established that molecular weight, aromatic- aliphatic ratio, -COOH, - OH functional groups and total acidity reduces with declining forest. Humic substances (HSs) isolated from pasture & forest land and in some soil enriched with some specific minerals favors excellent carbon sequestration power. The presence of simple structural components of wide molecular heterogeneity and high molecular size and weight, high degree of aromatic poly-condensation, higher degree of humification and the presence of more aromatic compound detected in some soil confirm carbon sequestration power. Intense vegetation, conservation agriculture and some chemical constituents of soil possess more carbon sequestration power, is a good index for restoring climate change.

Abstract ID : 095942

BETEL LEAF BASED INNOVATIVE BUSINESS MODEL FOR SUSTAINABLE WASTE MANAGEMENT AND ADDITIONAL INCOME GENERATION FOR FARMERS OF WEST BENGAL

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The betel-leaf fresh trade is an important agro-economic model of West Bengal involving domestic and export sector. Betel business produces sufficient amount of waste leaves on daily basis in betel-vines and in the market place. The perishability of raw leaf promotes environmental pollution and storage issues. The waste leaves could be utilized for medicinally important essential oil extraction. In the present study Kali-bangla germplasm collected from different parts of South 24 Parganas were used for extraction of betel leaf essential oil (BLEO). The leaves were kept in –20°C for five days and utilized for extraction of oil using modified hydro-distillation method. The process continued for 3 hours with 80°C constant temperature. The cold-treatment produced recovery of 2.0 ml of oil and 25 ml of hydrolysate from 1 kg of leaves. The oil and the fragrant hydrolosate have demand in pharmaceutical and food industries with multiple applications. The method is simple, low cost and pollution free. The training of the rural work-force could generate additional income for the farmers. The process could aid in agricultural waste management and this idea could be adopted as an innovative and sustainable business model in South 24 Parganas of West Bengal.

Abstract ID: 103654

AGRO-MORPHOLOGICAL CHARACTERIZATION AND ASSESSMENT OF VARIABILITY IN 66 AROMATIC RICE GENOTYPES.

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The study of agro-morphological traits during Kharif season at two different locations revealed a wide variability among the genotypes irrespective of locations. Traits like plant height, number of grains per plant and grain yield per plant showed a close resemblance between the corresponding estimation of GCV and PCV along with high heritability and genetic advance, therefore the environment had very little influence upon their expression. Correlation indicated selection towards the genotypes having greater number of tillers coupled with higher number of grains per panicle would be more rewarding to develop varieties with high yield potential. The correlation between grain yield per plant and total number of grains per plant was observed to be highly significant and positive. The investigation revealed that the genotypes like Marisal, Type-3 and Paramanya performed better than Gobindobhog regarding yield and other traits. The study also reveals that small and medium grained rice can perform better than the traditional Basmati types. Based on grain yield per plant, some other small and medium grained promising aromatic rice genotypes are CR DhanSugandha, Tulaipanji, Seetashal, Gandeswari, Kanakchur, Radhunipagol and Dudeswar. The distribution pattern of the gemplasm from different geographical regions into same cluster indicated that there was no association between clustering pattern and eco-geographical distribution of the genotypes. Furthermore, the highest genetic distance was observed between KaloNunia and Laljeera followed by KamaleKamini and Seetabhog. Desirable segregants are expected to be produced by crossing genotypes with a high dissimilarity coefficients.

Abstract ID : 115052

IDENTIFICATION OF *LACTOBACILLUS* SPP. FROM NATIVE POULTRY (*GALLUS GALLUS)* AND THEIR ANTAGONISTIC ACTIVITY AGAINST PATHOGENIC BACTERIA

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The poultry and livestock industries make substantial use of probiotics because of their beneficial qualities, which include their capacity to improve growth performance. Through immune system modulation, pathogen avoidance, and micro-ecological imbalance regulation, these probiotics improve the physiology of the host animals. The purpose of this study was to determine how beneficial *Lactobacillus* spp. functions as an antibacterial agent in anaerobic environments, particularly in the gut. In this investigation, *Lactobacillus* strains were isolated using selective agar media plate after fifteen samples were taken from the caecum of native poultry birds. Using both genotypic and phenotypic characterization, the isolates (n=10) were identified as *L. brevis* (2), *L. coleohominis* (1), *L. mucosae* (1), *L. reuteri* (4), and *L. vaginalis* (2). All the isolates, with the exception of two that could grow at 15°C, were mesophilic in character. The potential use of *Lactobacillus* isolates as antagonistic agents was shown by their exceptional capacity to inhibit the growth of seven different bacterial species which included *E.coli, Salmonella, Klebsiella, Citrobactor, Serratia, Staphylococcus, Bacillus*. This implies that particular *Lactobacillus* strains, like those found in the study, might be beneficial as probiotics.

Abstract ID : 012234

HARNESSING ENDOPHYTIC FUNGI FROM RICE ROOTS FOR SUSTAINABLE BIOCONTROL OF *MELOIDOGYNE INCOGNITA* IN TOMATO

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Meloidogyne incognita is a sedentary endoparasitic nematode that significantly endangers tomato and other solanaceous crops, resulting in yield reduction that may surpass 60% depending on environmental factors. The root-knot nematode (RKN) adversely affects agricultural productivity by developing galls in root apical tissues, which are characterised by multinucleated and polyploid large cells which act as nutrient sinks. Additionally, RKN infection predisposes root systems to colonisation by other soil-borne pathogens, amplifying the damage to plant health. Current nematode management strategies remain limited due to inefficiency, environmental concerns, and escalating costs, underscoring the need for sustainable biocontrol alternatives. In this study, we report on the isolation and functional characterization of rice root-associated endophytic fungi with biocontrol efficacy against *M. incognita*. Bioassays targeting *M. incognita* eggs and juveniles under both in-vitro and in-vivo conditions revealed that a specific fungal isolate Aspergillus niger F4 exhibits nematicidal activity, potentially via the production of secondary metabolites. Further investigation into the induced systemic resistance (ISR) and systemic acquired resistance (SAR) in nematode infected tomato plants was conducted through RT-PCR assays, substantiating significant changes of resistance-associated genes were found along with plant physiological changes in treated and untreated plants. The findings underscore the role of fungal secondary metabolites in enhancing nematode mortality and offer promising insights into the application of endophytic fungi as bio-control agents for RKN management in Solanaceous crops.

APPLICATIONS OF EMERGING TECHNOLOGIES INCLUDING AI/ML IN SUSTAINABLE DEVELOPMENT

Abstract ID : 070304

REAL-TIME DEEP LEARNING BASED INSPECTION SYSTEM WITH SPECTROSCOPY SENSOR

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Businesses that handle perishable goods, such as natural products and vegetables, may find it difficult to guarantee consistent item quality and rack life.Traditional quality control methods rely on manual inspections, which are prone to human error and usually overlook internal surrenders like bruising, over-ripeness, or decay.The majority of current automated frameworks only provide superficial evaluations and require immediate feedback.We suggest an AI-driven real-time review architecture that integrates deep learning technologies and a spectroscopic sensor for thorough and automated quality assessment in order to overcome these problems.Convolutional neural networks (CNNs) are used in the system's important learning demonstration to scan external features like shape, colour, and assessment and identify absconds like damage or ruin. Additionally, the spectroscopic sensor examines the inside structure and chemical makeup, identifying over-ripeness or secured disintegration that cannot be detected by surface analysis. In order to provide traceability, the system combines OCR with predefined differentiating proof filtering.With real-time input, the system reliably engages in fast planning and decision-making with current robotization systems, such as mechanical arms and transport belts, improving operational efficiency and reducing human error.Our solution is perfect for organizations ranging from food planning to e-commerce since it is adaptable and configurable, providing stable quality, minimizing abuse, and optimizing.Businesses may maintain their competitiveness in rapidly changing markets by utilizing the most advanced AI and spectroscopic technologies to transmit quality control. By leveraging the foremost later AI and spectroscopy propels, it passes on predominant quality control, making contrast businesses remain competitive in fast-paced markets.

Abstract ID : 073823

COST-FREE SCREENING FOR COGNITIVE HEALTH : KEYSTROKE ANALYSIS AS AN eHEALTH SOLUTION

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The third Sustainable Development Goal promotes good health and well-being, a goal that may be advanced through keystroke dynamics as an accessible behavioural biometric. Keystroke analysis shows promise not only for detecting cognitive impairments but also for identifying neurodegenerative disorders. Typing patterns are closely associated with brain function, suggesting that their analysis can yield insights into cognitive health. This study investigates the suitability of various typing interfaces (desktop or touchscreen), input durations, and text types for responsible AI in the detection of neural conditions. Keystroke monitoring offers multiple benefits: it is cost-free, facilitates home-based continuous screening, and aligns with emerging trends in eHealth. Such a screening approach could enhance diagnostics, therapy management, and treatment planning without the need for clinical visits. The method is innovative for sustainable healthcare, with broad applicability across populations, including students and professionals in online settings. For instance, keystroke dynamics may assist in assessing student stress or detecting neurodegenerative conditions, such as Parkinson's disease, through everyday activities with accuracy rates exceeding 86%. To validate keystroke-based models, this research utilised both established and newly created benchmark datasets. Advanced classification techniques further support the model's efficacy in real-world environments, demonstrating its potential as a valuable tool for neuro-cognitive and neurodegenerative disorder screening.

Abstract ID : 085618

ARTIFICIAL INTELLIGENCE MAY BE A VIABLE TOOL IN ACHIEVING THE SEVENTEEN SUSTAINABLE DEVELOPMENT GOALS IN TOTALITY: AN ANALYSIS

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It is evident that achieving 169 targets within the domains of 17 Sustainable Development Goals by 2030 is almost impossible. So, the different researchers are actually finding the loopholes in terms of Synergies and Trade-offs among the goals, so that the stakeholders understand where went wrong in the policy implementation. At this juncture, there is a question about the incorporation of Artificial Intelligence for the better impact of understanding the loopholes and enhancing the process mechanisms related to implementation. The present author by virtue of his position as a member of the SDG Task Force, has been studying the case histories of attainment status of SDG implementation from a global perspective. He firmly believes that implementation may be possible through a robust digital platform, though SDGs (Goal 1 to Goal 6) has limited access. It is imperative to submit his observation that if we cannot achieve Goals 1 to 6 through AI, it will be of little use, while applying AI to achieve the targets, pertaining to Goal 7 to Goal 12. Of course, there is immense importance of AI modeling studies in combating Goals 13, 14and 15. It is obvious to promote the actual importance of the goals to the stakeholders through grassroot level discussion involving the civil society. Excessive usage of AI would come as a barrier to reach the last two goals, 16 and 17. As per World Economic Forum and UN Secretary General, deployed ethically and responsibly, Artificial Intelligence can become a force for social good.

Abstract ID : 104247

MACHINE LEARNING TECHNIQUES FOR PREDICTION OF HEART DISEASE

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The advent of Education 4.0, marked by anytime, anywhere access to learning tools and smart applications, has revolutionized education. This transformation, particularly evident in the digitization of society, is underscored by the emergence of E-Learning and has become even more critical in the face of the ongoing COVID-19 pandemic. As students across all levels engage in remote learning, the challenges of maintaining attention and predicting learning outcomes have gained prominence. This research delves into the realm of Education 4.0, exploring the evolution of virtual learning, the challenges faced by both students and instructors, and the pivotal role of predicting student performance in addressing these challenges. The study surveys the landscape of neurocomputing, an integral part of artificial intelligence, and its applications in predicting student outcomes. The methodology employed focuses on an inclusive approach to accommodate diverse learning styles and emphasizes the use of Google Classroom as the platform. Key parameters include student identification, attendance, and class participation, are analyzed, and the conversion of quantitative metrics is detailed. The predictive models are implemented using algorithms like KNN, Gaussian Naïve Bayes, and Multiple Linear Regression. The results highlight Multiple Linear Regression as the optimal model, providing the basis for future predictions in virtual learning platforms. The research concludes with implications for the virtual learning environment and outlines future directions for refining predictive models and addressing individualized factors influencing student performance.

Abstract ID : 110929

ACUTE LYMPHOBLASTIC LEUKEMIA DETECTION IN MICROSCOPIC IMAGES: A CONVOLUTIONAL NEURAL NETWORK FRAMEWORK WITH DEEP LEARNING TECHNIQUE

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Acute Lymphoblastic Leukemia (ALL) is a serious form of blood cancer. Mainly, the white blood cells are affected by this disease. However, traditional diagnostic methods (e.g. CT scans and MRI) can be time-consuming, and they may halt the start of the therapy. Due to this problem, a prognosis model using the features from the medical data and utilization of deep learning technology is proposed to boost both speed and accuracy in ALL diagnosis. This system has been developed so that the blood smear images can be analysed using a robust Convolutional Neural Network (CNN) architecture. The initiative is the digital submission of the blood smears. The images are preprocessed based on the Region of Interest (ROI) and then placed in the CNN, that narrow down on the cell distortion thus detecting early leukemia development. The 3D image data obtained from the scans is printed as 1D vectors to refine the model further and make the construction easier. The image data is checked through several layers by the neural network model. These techniques not only speed up the diagnostic process but also render higher precision, thus the doctors are able to make quicker and more reliable prognosis for ALL.

Abstract ID : 111817

QUANTUM MODELLING: DETECTION IN HEALTHCARE IMAGING

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The growing sophistication of generative AI has introduced challenges in distinguishing AI-generated images from authentic medical imagery, a critical task in healthcare diagnostics. The paper presents a quantum-based model designed to address this issue, leveraging quantum computational principles to detect nuanced differences in pixel intensity, noise distributions, and semantic depth structures. The proposed model capitalizes on quantum processing's ability to capture complex image features that may be indistinguishable using classical methods. Through Quantum Processing Units (QPUs), the model tries to achieve enhanced efficiency, offering substantial reductions in processing time for high-resolution medical images—a crucial improvement for time-sensitive healthcare applications. The quantum approach enables more effective differentiation between AI-generated artifacts and original content by identifying patterns unique to synthetic imagery, which are often subtle yet significant in clinical contexts. The research also introduces a framework for similarity-dissimilarity analysis, wherein multiple QPUs are utilized to parallelize comparisons, improving the accuracy of distinguishing AI-generated images. This approach ensures robust, scalable performance across varied datasets, while maintaining high precision and reliability. The quantum model demonstrates clear advantages over classical techniques, particularly in terms of processing efficiency and detection accuracy. The increasing challenge of verifying the authenticity of medical images, this work offers a significant contribution to real-time image authentication in healthcare, ensuring the integrity of diagnostic tools in the face of advancing AI-generated content

Abstract ID: 112812

AN AI-BASED GRAPH COLOURING APPROACH TO INFORMATION SECURITY

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In the hi-tech digital world, information protection is a serious challenge, mostly during transmission through public channels. Due to the rapid proliferation of electronic commerce, the Internet of Things' (IoT) use of digital devices is drastically increasing therefore, data protection on digital platforms is turning into a serious issue in the present era. The characteristics of threats are always changing. To safeguard confidential information from anonymous users, scientists are continuously working to develop new models. In this paper, a unique artificial neural network approach has been used to protect information by identifying maximal independent sets (MIS) in a graph. A dynamic artificial neural network technique has been used to create a random graph for hiding messages into it. The suggested technique for concealing information is need-based and straightforward. To protect the privacy and authenticity of the digital platform, the proposed algorithm can be used to implant sensitive information. The time complexity of the developed algorithm is O(log n). The performance of the developed algorithm has been analysed compared to the existing algorithms and obtained better outcomes.

Abstract ID: 113803

DYNAMIC CONTROL OF NEUROMUSCULAR DISORDERS THROUGH AN INTEGRATED CFD AND MACHINE LEARNING DEVICE.

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The integration of Computational Fluid Dynamics (CFD) and Machine Learning (ML) has gained attention for addressing the challenges of Neuromuscular Disorders (NMD). This review examines studies where CFD models blood flow and therapeutic agent transport to neuromuscular junctions, offering new avenues for enhancing treatment strategies.

CFD simulations, using high-resolution meshing tools and turbulence models like Large Eddy Simulations (LES), have been employed to analyze fluid systems. Algorithms in Python and MATLAB optimize flow equations through the Finite Volume Method (FVM), providing precise control over variables such as pressure and velocity. These models enable a detailed representation of drug delivery mechanisms.

Machine learning techniques, particularly convolutional neural networks (CNNs), have been integrated with CFD data to predict fluid behavior in novel scenarios. Through hyperparameter tuning and feedback loops, these models refine CFD simulations, improving predictive accuracy. Particle image velocimetry (PIV) systems measure flow velocities, while parallel computing frameworks, such as OpenFOAM, enhance computational efficiency.

The studies reviewed show that combining CFD and ML can improve drug delivery predictions compared to traditional methods. However, challenges remain, including data generalization in dynamic biological environments. Future research is necessary to better integrate ML for real-time simulations, addressing these uncertainties.

In summary, while CFD and ML show promise for NMD treatment, refining these models for clinical applications requires ongoing investigation.

Abstract ID : 115004

THE IMPACT OF ARTIFICIAL INTELLIGENCE ON SCRIPTWRITING AND THE FUTURE OF CINEMA

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The integration of Artificial Intelligence (AI) in screenplay writing is transforming the film industry by providing tools that enhance creativity and streamline the writing process. While AI cannot replace the nuanced creativity of human writers, it serves as a valuable assistant in various stages of script development. Artificial Intelligence (AI) is revolutionizing various sectors, including the film industry, where it is becoming an increasingly influential tool in scriptwriting. This paper explores the evolution of scriptwriting, from traditional manual methods to digital platforms, and examines how AI is reshaping the creative storytelling process. By analyzing the role of AI in scriptwriting, the study highlights its benefits, challenges, and potential future impact on the film industry. Although AI cannot replace human creativity, its capacity to enhance scriptwriting opens new avenues for innovation, presenting both opportunities and concerns for filmmakers.In this paper we are trying to investigate the different new avenues of AI in script writing.

Abstract ID: 123026

LIGHTWEIGHT NEURAL ARCHITECTURES FOR BREAST CANCER DETECTION USING PRUNING TECHNIQUE BASED NAS SYSTEM ON HISTOPATHOLOGICAL IMAGES

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Breast cancer ranks among the most prevalent cancers globally, making accurate and early diagnosis essential for effective treatment and improved outcomes. In this study, a pruning technique based Neural Architecture Search (NAS) system is developed to discover lightweight neural networks for classifying malignant and benign histopathological images. The BreakHis dataset, containing microscopic images of breast tissue, is utilized to balance model accuracy with computational efficiency. By integrating pruning into the NAS process, the complexity of the generated architectures is significantly reduced while maintaining high predictive performance. Promising results have been achieved, demonstrating accurate classification with a substantially smaller model size. This approach is particularly beneficial for medical applications in resource-constrained environments, such as mobile or embedded devices, where both efficiency and diagnostic accuracy are critical.

Abstract ID: 124432

VCP^4 – DESIGN AND IMPLEMENTATION OF A NOVEL 4-TIER VEHICULAR CONGESTION PREDICTION MODEL FOR URBAN INDIA

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Traffic congestion poses significant challenges to Intelligent Transportation Systems globally. Indian cities, in particular, face unique constraints in detecting and predicting vehicular congestion due to limited traffic data and diverse traffic patterns. Therefore with a focus on improving urban mobility and productivity, this paper proposes VCP^4 - a 4-tier framework, integrating K-shell, HMM (Hidden Markov Model), and BiLSTM (Bidirectional Long Short-Term Memory) models powered by Blockchain technology, and further implements it as a comprehensive simulator as proof of concept. The simulator converts a snapshot of road networks into a graph to detect and predict traffic congestion using minimal information. Pollution data at city junctions, available from monitoring stations, is used as an observable metric to infer traffic states that are classified as low, medium, or high based on open-source map data. Subsequently, HMM generates optimal traffic state sequences over time, which are fed into BiLSTM model to predict future congestion. Furthermore, for cost-effectiveness and reduced computational overhead during implementation in Roadside Units (RSUs), only the densely connected zones are considered for detection and prediction by utilizing weighted K-shell algorithm. Finally, a consortium Blockchain framework binds the RSUs ensuring data security, transparency and synchronization. A case study in Kolkata, successfully detecting six key regions, demonstrated the system's effectiveness, with HMM achieving 93% accuracy in detecting congestion and BiLSTM reaching 95% accuracy in predicting future traffic states. Future work will focus on building low-cost RSUs equipped with this system and comparing traffic patterns across regions to develop adaptive traffic signaling systems.

Abstract ID : 125154

AI FOR SUSTAINABLE PUBLIC LIGHTING SYSTEMS: REDUCING ENERGY CONSUMPTION IN SMART CITIES

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Public lighting systems are significant consumers of energy in urban areas, often remaining active regardless of actual need. Street lighting represents about 3-4% of total electricity consumption in urban areas. Estimates suggest that India consumes around 1,200 to 1,500 MW for street lighting, translating to about 7 billion kWh annually. This paper discusses how AI can be used to create sustainable public lighting systems in smart cities by optimizing energy usage. AI algorithms can adjust street lighting based on real-time data from motion sensors, weather conditions, and traffic patterns, ensuring that lights are only active when needed. AI can also integrate with city grids to respond to peak and off-peak energy usage, further reducing electricity consumption. Cities can greatly be benefitted from AI-driven lighting systems by reducing operational costs and contributing to India's energy conservation goals. This research explores the technical mechanisms behind AI-based lighting systems, and propose future developments that could increase scalability and energy savings. Case studies shows that there is 30 % electrical energy saving by using Light sensor, Brightness sensor, Motion sensor, Passive infrared sensor, Internet of Things based automation and integrating the sensor output with AI based system public lighting system in smart cities.

BOTANY

Abstract ID : 030513

COMPLETE CHLOROPLAST GENOMES OF TWO DARJEELING TEA CULTIVARS AND THEIR PHYLOGENETIC IMPLICATIONS

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The variation in plant plastid genomes provides useful markers for studying evolutionary relationships and population genetics. Cultivated tea varieties, predominantly *Camellia sinensis* var. *sinensis* (CSS) and *C. sinensis* var. *assamica* (CSA), are widely grown in tropical and subtropical regions around the world. CSS is a slow-growing shrub with better cold-resistance, while CSA is fast-growing with larger leaves and is sensitive to cold. Differences in growth rate and leaf size between CSS and CSA have been ascribed to their distinct plastid genomes. Furthermore, the variation in plastid genomes between CSS and CSA can also be used to trace their evolutionary relationships and better comprehend the genetic diversity of cultivated tea populations. Present study reports whole chloroplast genome sequences from two elite cultivars of Darjeeling tea and compares them to global tea accessions. The chloroplast SSRs and indel markers were discovered to be useful in discriminating between Assam and China tea lineages. Concatenated multiple sequence alignments of protein coding genes anticipated the cladogram with global *Camellia* accessions. Collective information revealed distinct clades of cultivated tea, which are complementing with earlier phylogenetic insights of Indian tea cultivars.

Abstract ID : 061703

ISOLATION OF NITROGEN FIXING BACTERIA FROM *Clitoria ternatea*

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Root nodule bacteria colonize the roots of leguminous plants and form nodules converting atmospheric nitrogen into ammonia. This mutualistic relationship gives vital nutrients to plant and carbon source to bacteria. We isolated and characterized bacterial strains (O1-O6, P1-P9) from the roots of *Clitoria ternatea* on YEMA media. Most strains produced milky-white or creamy-white, mucoid colonies. Gram staining revealed 3 positive rods (O3, O6, P4), 6 negative rods (O4, P1-P2, P6-P8), 1 negative coccus (O1), and 5 positive cocci. All strains except P6-P9 were catalase positive, and none tested positive for *Agrobacterium* based on the keto lactose test. Growth on CR-YMA-$CaCO_3$ and biochemical assays, including oxidase, urease, citrate, and starch hydrolysis tests, further characterized the strains. O2, O3, O6, P1, P2, P5, P7, and P8 showed zones of starch hydrolysis. Strains O4, P1-P2, and P6-P8 were identified as *Rhizobium* species, likely *R. trifolii*, *R. phaseoli*, or possibly *Bradyrhizobium*. Previous studies on *Clitoria* roots also detected multiple *Rhizobium* strains. Ammoniacal nitrogen removal was measured for all isolates, although further analysis is required to determine their phylogeny and nodulation effects through 16S rDNA/internal transcribed spacer region studies. These findings suggest that the isolated *Rhizobium* strains could be valuable as biofertilizers for sustainable agriculture.

Abstract ID : 065429

MICROBIOLOGICAL ANALYSIS OF PROBIOTICS FROM MILK AND MILK PRODUCTS

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Probiotics are the living microorganisms well known for health benefits that they provide to the host. Common sources of these probiotics are milk and milk products that we use in our daily diet.

In this study, 10 strains (SK 1-16) isolated from raw milk and milk products (curd, paneer, Yakult) were grown on MRSA under microaerophilic conditions. Morphologically, they exhibited either milky white or creamy white, mucoid, small or medium sized colonies. All the strains were gram positive coccus (except SK 2& SK 6) and gave MR-VP negative results. We obtained both catalase positive and negative strains, majority showed dextrose and lactose fermentation and intriguingly all the strains were able to grow in pH 5.5 and NaCl 2.5%. Except SK9 and SK 12, all the strains were tolerant towards 2.5-8.5% NaCl and pH 2-6 (except SK 9). Carbohydrate fermentation with various sugars gave mixed results.Analysing the results, it was concluded that four species were *Paediococcus sp.* (SK 3, SK 4, SK 9 and SK 12). SK 2 and SK 6 were likely *Lactobacillus sp.* SK 14, SK 15 and SK 16 were identified as *Enterococcus sp.* SK 1 was identified as *Saccharomyces sp.* Bile tolerance, antagonism against pathogenic bacteria, phylogeny, etc. remain to be evaluated. Identifying the potential probiotic strains among these strains can confirm their utilization in the creating better functional foods and thereby improve the public health.

Abstract ID : 010413

NICKEL ALTERS ROS-NO DYNAMICS IN CHERRY TOMATOES TO LOOM IN CELLULAR DISRUPTION

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Various industrial uses and anthropogenic activities of bulk nickel (Ni) have catapulted their environmental escalation leading to major exposure risk on flora and fauna. The element Ni though an essential one in the survival of plants, it is also a perilous pollutant that cripples plant growth and cause loss of vigour and productivity. It is also a graded carcinogen (grade IV) according to WHO and other local bodies. The interplay of reactive oxygen species and nitric oxide is important for proper functioning of plant biochemical whorl. Yet little is known about the effect of Ni at various doses on economically important plants at the cellular level at prolonged exposure window beginning from germination to flowering. The present study, showcased the effect of wide ranges of Ni exposure in a plant whose fruits are more often consumed raw by human beings. Quantitative spectrofluorimetric analyses and qualitative detection through laser scanning confocal microscopy (LSCM) of both ROS and NO followed dose dependent increase in toxicity. In tandem, peroxidase and superoxides among ROS showed significant increase from 50 mg L^{-1} Ni exposure. Total sugar, increased antioxidant enzymes, uprising lipid peroxidation confirmed a general deterioration of the biochemical well-being of the Ni exposed tissue. It is one of the premier studies to document the intricate dynamics of ROS-NO with the antioxidant profiles within a plant; subjected to long duration stress induced by Ni exposure and could hold cues to better understanding of plant's adaptability to heavy metal and xenobiotic stress in near future.

Abstract ID : 082427

ANTILEISHMANIAL AND MOLECULAR DOCKING STUDY OF WILD EDIBLE MUSHROOM *AMANITA PRINCEPS* TARGETING POLYAMINE SYNTHESIS PATHWAY

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Visceral Leishmaniasis (VL), caused by *Leishmania donovani*, ranks as the second deadliest parasitic disease, leading to over 65,000 deaths annually. The current synthetic drugs used to treat this disease often cause significant side effects, highlighting the need for safer alternatives. In this context, mushrooms, known for their diverse secondary metabolites with potential therapeutic benefits, are being explored as a source of antileishmanial agents. After screening sixteen extracts from eight species of wild mushrooms, the hydroalcoholic extract of *Amanita princeps* demonstrated remarkable antileishmanial activity against *Leishmania donovani*. Metabolomic analysis of this promising extract revealed 50 bioactive compounds, 10 of which were selected for further *in-silico* testing against five key targets: arginase, spermidine synthase, ornithine decarboxylase, trypanothione reductase, and SOD, all of which play crucial roles in maintaining the thiol-redox balance in the parasite's polyamine synthesis pathway. Molecular docking studies identified two compounds, ergosterol, and Taraxacolide 1-0-β-D-mglucopyranoside, with the highest binding affinities of -15.8 and -11.8 kcal/mol, respectively, against ornithine decarboxylase. However, subsequent molecular dynamics (MD) simulations and free energy calculations using MM-GBSA revealed that Taraxacolide 1-0-β-D-glucopyranoside exhibited greater stability with PASP receptors, suggesting it as a particularly promising antileishmanial compound. Additionally, *in vitro* assays measuring arginase, SOD, and nitric oxide activity supported the *in-silico* findings, further confirming the antileishmanial potential of the *Amanita princeps* extract. Thus, *in-silico* and *in-vitro* analyses point to Taraxacolide 1-0-β-D-glucopyranoside as potent antileishmanial agents derived from *Amanita princeps*.

ALPHA-MANGOSTIN FROM *GARCINIA COWA* MODULATES THE CROSSTALK BETWEEN ARGINASE AND NITRIC OXIDE IN *LEISHMANIA DONOVANI* PARASITE

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Visceral leishmaniasis (VL), commonly known as Kala-azar in India, is a life-threatening disease affecting internal organs such as the spleen and liver. Among numerous sp., *Leishmania donovani* is the responsible obligate parasite for VL in the Indian subcontinent. The lack of treatment and inefficacy of the modern-day drugs available in the market pushes researchers to find safe, natural alternatives. During our course, a North-Eastern plant belonging to the Clusiaceae family, *Garcinia cowa,* has been found effective. Alpha-mangostin, a natural xanthonoid detected in the bark of this particular tree, was also found to possess leishmanicidal potentiality. The compound was found to induce oxidative stress-mediated apoptotic death in the *Leishmania donovani* parasite accompanied by nuclear fragmentation, mitochondrial dysfunction, and arrest in cell cycle progression. Arginase (ARG) is a critical enzyme for parasite survival and virulence as by degrading L-arginine, it reduces the availability of this amino acid for nitric oxide synthase (iNOS) for the production of parasite-killing nitric oxide (NO). Investigations during the study revealed that the compound suggestively inhibited the ARG activity while facilitating the production of NO. Furthermore, cytokine profiling of selected cytokines signified the initiation of an inflammatory cascade promoting parasite death upon compound administration. Therefore, the study so far has provided conclusive affirmation of the antileishmanial potential of the compound mangostin mediated by the interactions with two crucial factors i.e, ARG and NO.

Abstract ID : 075435

UNRAVELING THE POTENTIAL OF SILICON NANOPARTICLE IN MITIGATION OF Cd STRESS IN RICE

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Cadmium (Cd) is one of the most widespread and potent abiotic hindrances. Being highly mobile, Cd is easily absorbed by rice (*Oryza sativa* L.) and incites growth inhibition, chlorosis, wilting, poor seed germination, cell disruption and cell death. Nanoparticles have immense significance in ensuring optimal plant development under hostile environment by modulating bio-physiological responses. The objective of present work is to evaluate beneficial role of nano Si-administration in Cd stressed rice. 7 days old rice seedlings (var. Khitish) were cotreated with $CdCl_2$ (10 µM) with silicon dioxide NPs (SiO_2NPs; 2.5 ppm) in hydroponics for additional 7 days. At 14 days, we evaluated different physio-biochemical parameters and gene expression of transporters. The plants were grown in pot till maturity, and different agro-morphological traits and yield components were recorded. From our lab experiments, it was revealed that SiO_2NPs alleviate Cd toxicity by enhancing growth, photosynthesis, antioxidant defence mechanisms and lowering lipid peroxidation, methylglyoxal contents. In SiO_2NPs treated rice seedlings, expression of *OsIRT1* (responsible for Cd uptake) was significantly downregulated and *OsLsi1* and *OsLsi2* were genes overexpressed (responsible for Si transport). Moreover, nano Si supplemented rice plants exhibited the highest rate of yield attributes (panicle number, number of filled grains per panicle, grain weight) relative to Cd stressed plants. Thus, in future, nano Si can be an effective nano-fertilizer to develop Cd safe rice cultivars.

Keywords: Cadmium stress, hydroponics, rice, silicon nanoparticle, yield

Abstract ID : 083807

CLONING AND ANALYSIS OF SbDhn2 PROMOTER IN *SORGHUM BICOLOR*

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Plants rely on stress-responsive proteins, such as Late Embryogenesis Abundant (LEA) proteins, to survive osmotic stresses. Dehydrin, a group II LEA protein, is known to be upregulated under various stress conditions. The objective of this study is to analyze the promoter region of the *SbDhn2* gene in *Sorghum bicolor* to understand its regulatory mechanisms under stress. A 1.6 kb upstream sequence of the *SbDhn2* gene (GenBank accession: XM_002452726.2) was analyzed using bioinformatic tools, identifying key cis-elements, including 8 TATA boxes, 13 CAAT boxes, and various stress-related motifs such as 4 Abscisic acid-responsive elements, 5 STRE elements, and a MYC binding domain. Based on these findings, different promoter deletions were designed and cloned into the pCAMBIA1301 binary vector, followed by transformation into *Agrobacterium*. The transient expression assays in *Nicotiana benthamiana*, monitored via GUS assay, showed that the 1640 bp construct exhibited the strongest expression, suggesting that these regions are crucial for stress-induced gene activation. Future studies will focus on stable transformation and in-depth functional analysis of these promoter constructs in staple crops. Understanding the regulation of *SbDhn2* under stress conditions can be harnessed to develop genetically modified crops with enhanced resistance to environmental stressors such as drought and salinity. This research has important implications for sustainable agriculture by improving crop resilience and productivity in the face of increasing global climate challenges.

Abstract ID : 103649

INHIBITION OF HCV RNA DEPENDENT RNA POLYMERASE (RdRp) BY LEAF EXTRACTS OF *OCIMUM TENUIFLORUM*

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Hepatitis C virus (HCV) remains a significant global health challenge, with over 50 million active cases worldwide. The absence of a vaccine and the need of more affordable treatments drive research into less toxic, pan-genotypic antivirals. Our study evaluated the *in vitro* efficacy of *Ocimum tenuiflorum* leaf extract against HCV NS5B. Ethyl acetate and ethanol sub-fractions demonstrated significant interaction with NS5B in an intrinsic fluorescence quenching assay at 8 µ/g/mL. These concentrations were well below 50% cytotoxic concentrations (CC_{50}), as determined by cytotoxicity assays. Ongoing activity-guided fractionation aims to isolate the lead anti-HCV NS5B compound.

Abstract ID : 103842

DELVING INTO THE POTENTIALITY OF PHYTOPLANKTON IN BIOMONITORING THE WATER QUALITY OF THE INDIAN SUNDARBANS

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Sundarbans, recognized as the largest mangrove ecosystem, was the focus of our research, aiming to analyze the spatiotemporal variations in phytoplankton assemblages along five distinct sites within the Indian Sundarbans: Fraserganj, Gadkhali, Kumirmari, Dobanki, and Canning across an ecological gradient. Phytoplankton contributes to the primary productivity of the ecosystem and serves as key water quality indicators. Even minimal fluctuations within their communities have substantial implications on global climate alterations. Therefore, it is imperative to monitor their levels to uphold ecological balance. This study involved thorough examination and statistical validation of hydrological parameters in conjunction with phytoplankton dissemination, revealing significant seasonal variations that, in turn, influenced phytoplankton dynamics. Bacillariophyceae exhibited prevalence throughout the study period, with peak abundance during summer (4.7×10^3 individuals/L). In contrast, winter displayed increased pollution resulting from tourist activities, specifically the disposal of waste and litter decomposition from mechanized tourist vessels, leading to a surge in Dinoflagellate populations, particularly *Ceratium* sp. (15.6×10^3 ind/L) and serving as eutrophication indicators in the ecosystem. Pearson's chi-square test confirmed distinct association between phytoplankton abundance and seasonal variability (p-value $< 2.2e^{-16}$). Furthermore, fluctuations in nutrient levels can trigger dinoflagellate blooms, significantly impacting water quality and altering primary production and biogeochemical cycles. Multidimensional Scaling (stress value < 0.01) further validated the similar trends, indicating anthropogenic activities likely to be the primary cause. To address these concerns, it is essential to implement sustainable tourism practices considering the carrying capacity of this deltaic ecosystem, thereby preserving it as a World Heritage Site.

Abstract ID : 103841

EXPLORING THE POTENTIAL AND DYNAMICS OF BIOACTIVE COMPOUNDS FROM *LAWSONIA INERMIS* L. AGAINST COVID

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After the deadly and infectious pandemic, COVID, the world has realised the harmful side effects of synthetic drugs. According to the WHO, an alarming number of 80% of the population of developing countries depend on plant-based medicines for treating various diseases. Synthetic drugs, having long term side effects, makes it important to shift to plant-based alternatives. One such plant is *Lawsonia inermis*, renowned for being the source of dye Mehendi. The plant with its rich plethora of phytochemicals is an important asset in the commercial and medicinal sectors. In this particular study we have performed the LCMS analysis to profile the phytochemicals present within the plant, and docked them on the active site of Nsp3 protein of the SARS-CoV2, an important protein in maintenance of virus life cycle. After screening by Lipinski's rule of five, pharmacokinetic studies, and hydrogen bonding interactions, the shortlisted candidates were further subjected to molecular dynamic simulations, for a period of 100 nanoseconds, during which the protein-ligand complexes are studied in a solvated environment which mimics the human system. It was observed that, among the phytochemicals, lawsone (the main pigment component) and caffeic acid emerged as good candidates, with stable energy parameters, and strong affinity to the protein. Molecular dynamic simulations also revealed the presence of a compact and stable structure within the given timeframe of 100 nanoseconds. This study successfully throws light and explores into the possibility of an alternative from a commercial plant, with less harmful side effects, against a deadly infectious disease.

UNDERSTANDING THE TISSUE-SPECIFIC PATHWAY ALTERATIONS IN SESAME PLANTS AFFECTED BY PHYTOPLASMA

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Sesamum indicum (Pedaliaceae), the oldest known oilseed crop, is in global demand, largely due to its high-quality oil, rich in antioxidants. Despite this, sesame production in several countries, including India, has been compromised by a disease caused by *Candidatus* Phytoplasma, a cell-wall lacking bacterium, which is spread by insect vectors like the brown planthopper. The present investigation reveals that Phytoplasma infection leads to deformations in cellular morphology, altered physiological processes and differential metabolic responses of the plant. Affected plants exhibit smaller leaf size, reduced leaf area, and decreased levels of photosynthetic pigments. The infection causes oxidative stress and the degree of this stress varies between foliar and floral tissues. This investigation also explored the alternation of metabolic pathways in response to the infection. Tissue-specific metabolomics, using Liquid Chromatography tandem Mass Spectrometry (LC-MS/MS), revealed significant changes in pathways involved in biosynthesis and regulation of phenylpropanoid, lignan, sugar, flavonoids, etc in different tissues. Importantly, certain pathways responded differently in foliar and floral tissues due to infection, such as the chlorophyll metabolism pathways. The metabolomic analysis indicated that the impact of phytoplasma infection is more prominent in floral tissues than in foliar tissues. The LC-MS/MS data were further validated through biochemical analyses and gene expression studies. Overall, this study highlights tissue-specific reprogramming of metabolic networks in sesame in response to *Candidatus* Phytoplasma infection.

Abstract ID : 113059

SOLVENT BASED COMPARATIVE ANALYSIS OF BIOACTIVE COMPONENTS OF PRESENT IN THE LEAVES OF "MIRACLE TREE" USING HIGH-THROUGHPUT TECHNIQUES AND ITS ANTI-MICROBIAL AND TOXICOLOGICAL STUDIES

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The Indian Ayurveda system since past ages have shown effectivity of several plants and their different parts in curing not only chronic diseases but also in preventing some very rare yet fatal ones. One such is the *Moringa oleifera* tree , commonly known as "Sajne" in Bengali. Belonging to the moringaceae family , this plant has been known to show effective property in preventing seasonal flu, viral infections and also measles and chicken pox. This is an annual plant that flowers during the spring season, and is mainly famous among local and native people. Due to its profound phytochemical and nutritional constituents like polyphenols, flavonoids , tannins and amino acid and protein content this plant leaf is in great use both in cooked and in powdered form. However, recent studies and scientific reports have also concluded that several parts of this plant including its flowers, fruits (drumsticks) and seeds have shown huge antioxidant potency and thus is said to be effective in preventing cancer including breast cancer (flower) and colon cancer(fruits and seeds) making it very much logical to be called as the miracle tree. This research work mainly focuses on quantification of phytochemicals in different extracts, their LC/ESI MS MS and GC-MS based secondary metabolite and Volatile Organic Compound profiling of dry Moringa leaves in different solvent (methanol, aqueous and hot infusion) and hence their anti-microbial and toxicological study of the most potent solvent extract.

Abstract ID : 035103

INHIBITORY EFFECTS OF LUTEOLIN, A FLAVONOID ON *SALMONELLA* TYPHI AND ON ITS DIHYDROFOLATE REDUCTASE PROTEIN

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Luteolin is a naturally occurring flavonoid found in many fruits and vegetables and reported to have health benefits. It's an allelochemical produced by plants as a defence against pathogens. In the previous report, we identified its presence in *Scoparia dulcis* root extract, a well-known herb. In this report, we evaluated luteolin's activity against multidrug-resistant clinical isolates of *Salmonella* Typhi. *Salmonella* Typhi is a common food contaminant and a causal organism for human-restricted typhoid. WHO estimates as of 2019, there are 9 million cases of typhoid annually, resulting in about 110,000 deaths per year. The emergence of drug-resistant mutants of *Salmonella* Typhi has become a growing concern which demands alternatives to traditional antibiotics. Luteolin in *in vitro* test had MIC (Minimum Inhibitory Concentration) value ranging from $\leq$ 0.5 mg/ml to >0.01 mg/ml against tested *Salmonella* Typhi isolates and its effect can cause a decrease in growth rate. It also had a negative effect on biofilm formation and disruption and can restrict the *Salmonella* Typhi cells from invading mammalian macrophage cells. Luteolin, which in the computational screen showed druglike properties and was predicted to fall under toxicity class 4, had shown great binding affinity to the Dihydrofolate Reductase protein of *Salmonella* Typhi in virtual docking. And in *in vitro* setup, it showed a negative effect on the protein's activity.

Abstract ID : 032454

PLANT PIGMENTS: A MEDICINAL PERSPECTIVE

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Plant pigments, the colorful compounds that give plants their hues, have long been recognized for their potential medicinal properties. These pigments, primarily derived from secondary metabolites, play a crucial role in various physiological processes within plants, including photosynthesis, protection against environmental stressors, and signaling. A diverse array of plant pigments, including chlorophyll, carotenoids, flavonoids, and betalains, have been extensively studied for their therapeutic potential. Chlorophyll, the green pigment involved in photosynthesis, has been explored for its antioxidant and anti-inflammatory properties. Carotenoids, responsible for the orange, red, and yellow colors of fruits and vegetables, are known for their antioxidant activity and potential benefits for eye health. Flavonoids, a class of polyphenols, exhibit a wide range of biological activities, including antioxidant, anti-inflammatory, anti-cancer, and cardioprotective effects. Betalains, found in beets and cacti, possess antioxidant and anti-inflammatory properties. Medicinal plants from various families, including Asteraceae, Lamiaceae, and Fabaceae, are rich sources of these pigments. Traditional medicine systems, such as Ayurveda and Chinese medicine, have long utilized plant pigments for treating a variety of ailments, including digestive disorders, skin conditions, and chronic diseases. Our work proposes many of these traditional claims, highlighting the potential of plant pigments as natural therapeutic agents.

Abstract ID : 064156

METABOLITE FINGERPRINTING/ ANALYSIS AND ANTIDIABETIC POTENTIAL OF SOME KNOWN PLANTS

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India boasts a rich heritage of medicinal plants which are used in traditional Ayurvedic medicines for treating various ailments. This offers a wide area of research to discover potential therapeutic compounds present in these plants that promotes health restoration.

This research investigates the metabolite profile and anti-diabetic potential of four known medicinal plants: Cassia angustifolia sp., Saraca asoca sp., Mimusops elengi sp., Terminalia arjuna sp. By employing advanced analytical techniques, we aim to create a comprehensive metabolite fingerprint for each plant, providing insights into their unique chemical composition. Furthermore, we will conduct a thorough phytochemical screening to identify the bioactive compounds present in these plants, including alkaloids, flavonoids, terpenoids, tannins and polyphenolic compounds. Antioxidant assays will be performed to evaluate the plants' capacity to neutralize harmful free radicals, a critical factor in preventing oxidative stress-related diseases. To assess the anti-diabetic potential of these plants, we will investigate their ability to inhibit á-amylase, a key enzyme responsible for breaking down carbohydrates. By inhibiting á-amylase, these plants could potentially delay the absorption of glucose, leading to improved glycemic control. We will determine the optimal concentration of plant extracts required to achieve maximum á-amylase inhibition.

This research will provide a comparative study of metabolite and phytochemical profiles of each of these plants, providing insights about various metabolites and cellular pathways involved in synthesizing them. It will also contribute to our understanding of therapeutic properties found in these medicinal plants and their potential applications in the management of diabetes. By identifying the bioactive compounds responsible for their anti-diabetic effects, we can explore the possibility of developing novel drug candidates or functional food ingredients.

Abstract ID : 074930

PHYTOCHEMICAL ANALYSIS AND ANTIOXIDANT POTENTIAL STUDY OF COMMONLY FOUND GREEN LEAFY VEGETABLES

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The present study focuses on the phytochemical analysis and antioxidant potential of commonly found green leafy vegetables (GLVs), which play a significant role in human nutrition due to their rich content of bioactive compounds. GLVs are an excellent source of essential vitamins, minerals, fiber, and an array of phytochemicals like flavonoids, phenolic acids, tannins, and alkaloids, which contribute to their antioxidant properties. This study aims to evaluate the presence of these phytochemicals in various commonly consumed GLVs, including Brahmi Saag (*Bacopa monnieri*), Gima Saag (*Glinus oppositifolius*), Kolmi Saag (*Ipomoea aquatica*) and others.Phytochemical screening was performed

using standard qualitative methods to detect the presence of flavonoids, saponins, tannins, alkaloids, and phenolic compounds. Additionally, the antioxidant activity of these vegetables was assessed through in vitro assays, including the DPPH radical scavenging assay and Ferric Reducing Antioxidant Power (FRAP) assay, to determine their capacity to neutralize free radicals.The results demonstrated significant variation in the phytochemical composition and antioxidant potential across different GLVs. Spinach and kale exhibited high levels of phenolic compounds and flavonoids, contributing to their superior antioxidant activities. These findings suggest that regular consumption of these GLVs could provide health benefits associated with oxidative stress reduction, such as the prevention of chronic diseases including cardiovascular disease, cancer, and neurodegenerative conditions.This study underscores the importance of GLVs as a natural source of antioxidants, advocating for their inclusion in daily diets to promote overall health and well-being.

Abstract ID : 043743

COMPARATIVE STUDY ON THE EFFICACY OF ISSR AND SSR MARKERS TO DETECT GENETIC VARIATION IN SOME POPULATION OF *AQUILARIA MALACCENSIS* LAM. FROM TRIPURA, INDIA

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Aquilaria malaccensis is an evergreen tree, found in the foothills of the sub-Himalayan region of North-East India, Bangladesh, Burma and Malaysia. The production of agarwood and its use in perfumery and medicinal purpose is of great antiquity. Present study focuses on the efficacy of ISSR and SSR markers in assessing genetic diversity of this plant from Tripura, India. 14 ISSR and 35 SSR primers were tested against the ten populations of *Aquilaria malaccensis*. 115 distinguishable bands were generated from ISSR markers of which 99 bands (84.5%) were polymorphic and among 79 scorable bands from SSR markers 52 (65.82 %) were polymorphic. Nei's gene diversity (*h*) was calculated 0.28 and 0.23 for ISSR and SSR, respectively, as derived from the Popgene analysis. No overlapping in PCA matrix and Dendrogram analysis through UPGMA (Unweighted paired group method with arithmetic mean) implicate intra-specific diversities. Based on the statistical data like polymorphic percentage, PCA, and Dice similarity coefficient generated for ISSR and SSR markers, we can conclude that ISSR markers are more suitable in determining the genetic polymorphism among the populations of *Aquilaria malaccensis*.

EFFECT OF A CELL-FREE CULTURE EXTRACT FROM *ALTERNARIA ALTERNANTHERAE* ON PHYSIOLOGICAL AND BIOCHEMICAL PROPERTIES OF ALLIGATOR WEED (*ALTERNANTHERA PHILOXEROIDES*)

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Alternaria alternantherae is a biocontrol agent for managing alligator weed (*Alternanthera philoxeroides*) in many countries including India. The fungal metabolites biologically control weeds by causing chlorosis, necrosis, wilting, and growth inhibition. There are diverse modes of action via which these metabolites control weeds, like manipulating the metabolic processes and inducing the production of ROS (reactive oxygen species). This study focused on the effect of cell-free culture extract from the fungus on alligator weed's physiological and biochemical properties. The metabolites of different concentrations (75mg/ml, 56.25mg/ml, 37.5mg/ml, 18.75mg/ml, and 0mg/ml) were applied on alligator weed and growth rate, germination percentage, pigment damage, malondialdehyde (MDA), H_2O_2, DPPH, Flavonoid, Phenolics, Guaiacol peroxidase (GPX), Ascorbate peroxidase (APX), Catalase, and total protein was assessed. These metabolites significantly restrict growth rate and germination percentage while increasing pigment damage, MDA, and H_2O_2 production in increased concentrations. There was no significant difference found in catalase production. DPPH production was restricted in increasing concentration while production of GPx, APx, total protein, Flavonoid, and phenolics production was increased up to 56.25mg/ml and then significantly decreased in 75mg/ml. This study provides new insights to understand the biochemical aspects of the metabolites which can help decode their mode of action, stability, and prospects for application.

BIOTECHNOLOGY

Abstract ID : 082932

DECIPHERING THE MICROBIOME METABOLOME SIGNATURES OF INDIA'S OLDEST WASTE DERIVED PLANT BIOSTIMULANT *KUNAPAJALA*

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The exponential population rise necessitates intensive agricultural practices, unfortunately generating massive daily waste. A promising solution lies in conservation-based regenerative agriculture, promoting closed-loop nutrient cycling via recycled organic waste. This circular bio-economy approach fosters synergistic interactions between soil biota and plants, enhancing ecosystem services and agro-ecosystem resilience. This resource-efficient strategy represents a paradigm shift towards sustainable agriculture, aligning production with ecological intensification and circularity principles. *Kunapajala* (KPJ) an ancient Indian plant bio-stimulant derived from animal waste, has shown promise in supplying essential nutrients and harbouring beneficial microbes. Despite its proven benefits, high-throughput scientific evidence of its multifaceted potential for promoting plant growth remains largely unknown. This study aims to decipher the microbiome metabolome signatures of fish-and livestock waste derived KPJs, specifically focusing on its plant biostimulant potential. Our data revealed KPJs are reservoir of plant available macronutrients, PGRs and bioactive compounds. Further we estimated population of different classes of microbes in KPJ including those having plant beneficial traits. Additionally, whole genome metagenome-based study confirmed that KPJs are dominated by bacteria with over 30% of microbial genera assigned to plant growth promoting rhizobacteria (PGPR) class. KEGG analyses further revealed carbohydrate and amino acid metabolism as predominant metabolic pathways, describing organic matter conversion of KPJ into small hydrolysates and metabolites. Further, LC-QTOF-MS were employed to identify metabolites present within KPJ and further translated to elucidate their biological functions. Overall, this study enlightens the dynamic relationship of non-microbial and microbial network of the KPJ system and their biostimulant potential in sustainable agriculture.

Abstract ID : 084918

miR-101-3p REGULATES THE EXPRESSION OF Tbx20 AND Bmp2 TO AUGMENT CARDIAC INJURY BY MODULATING SENESCENCE AND INFLAMMATION: A PLAUSIBLE BIOMARKER OF CARDIOMYOPATHY

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Globally, cardiovascular diseases (CVDs) constitute the primary cause of mortality, hence early detection is indispensible. Recently we showed Tbx20 and Bmp2 are increased along with increased cardiomyocyte proliferation during ER stress and diabetes to restore homeostasis. But in rodent heart, prolonged ER stress caused downregulation of Tbx20 while Bmp2 expression increased (Das et al., J Biol Chem 2023). This led us to unravel the mechanism behind their differential regulation during cardiomyopathy in murine heart. As miRNAs frequently affect gene profiles during cardiomyopathy, we thus postulated that miRNAs regulate this differential expression profile of Tbx20 and Bmp2 during ER stress induced cardiomyopathy and diabetes. In the heart, cardiomyocytes and fibroblasts are the two most prevalent cell types. We showed that cardiomyocytes had greater Tbx20 levels than fibroblasts whereas Bmp2 inhibitor Noggin (Nog) is expressed more in fibroblasts. *In silico* analysis showed probable miR-101-3p binding site in the 3'UTR of Tbx20 and Nog which was corroborated by luciferase assay using wild type and mutant 3'UTR of Tbx20 and Nog. miR-101-3p levels were increased during prolonged ER stress/diabetes. miR-101-3p mimic and inhibitor resulted in decrease of Tbx20 and Nog in cardiomyocytes and fibroblasts respectively. Decrease in Tbx20 resulted in increased senescence of cardiomyocytes. Whereas, downregulation of Nog resulted in increased expression of Bmp2 with concomitant augmentation of fibroblast inflammation. Taken together, our study shows the novel function of miR-101-3p in inducing cardiac injury and can be used for detection of CVDs. Therefore, this study establishes miR-101-3p as a plausible biomarker for cardiomyopathy.

Abstract ID : 021031

EXTRACTION OF SECONDARY METABOLITES FROM RADIATION-RESISTANT *BACILLUS* SPP. TO EVALUATE THEIR ANTIOXIDANT AND ANTICANCER PROPERTIES

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Secondary metabolite production is one of the major defence lines of bacteria against oxidative bursts. Present research work is based on the extraction of secondary metabolites (SM) from 3rd, 6th, 10th and 14th day's cell-free extracts of two radiation-resistant *Bacillus* spp., namely BR16 and BR1, isolated from radon-contaminated groundwater of Jharkhand. Both can withstand higher doses of hydrogen peroxide-derived (10, 25 and 50 mM) and gamma radiation-induced (2 kGy) oxidative stress. The anti-oxidative properties of SM were evaluated through a free radical (DPPH) scavenging assay and the phenolic and flavonoid content were measured. SM of *Bacillus* sp. BR16 and *Bacillus* sp. BR1 exhibited the highest free radical scavenging potential on days 3 (70%) and 6 (60%) respectively. On this account, assessment of anticancer potential (MTT) and ROS measurement (DCFDA) of those same were done in human lung cancer (A549), prostate cancer (PC3), glioblastoma (U87MG) and cervical cancer (HeLa) cell lines. Both demonstrated ROS-mediated cytotoxic activity. Survivability of cancer cells was reduced below 50% at the highest dose (20 mg/mL) by increasing ROS 1.2-1.6 fold approximately. Analyzing the same crude SM by HPLC depicted the presence of secondary metabolites by generating several distinct peaks, which might be some prospective antioxidants. This scenario illustrates the SM of the aforementioned bacterial strains as a formidable barrier against redox imbalance and cancer.

Abstract ID : 014344

INTEGRATING COMPUTATIONAL AND EXPERIMENTAL APPROACHES TO IDENTIFY AND CHARACTERIZE HUMAN GUANYLATE BINDING PROTEIN DERIVED PEPTIDES IN THE ELIMINATION OF*LEISHMANIADONOVANI*

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Leishmaniasis, caused by the parasite *Leishmania sp*, is second most deadly parasitic disease globally with an estimated more than 1 million annual cases over 90 countries. Over the past few decades, although significant progress has been made in the discovery of the new drugs against leishmaniasis, it suffers from drug resistance and treatment failure owing to toxic side effects, drug susceptibility, tolerance, pharmacokinetics and resistance. In search for new alternative host-directed therapies, we explored the potential of interferon inducible-guanylate binding proteins (GBPs) which have broad spectrum antimicrobial roles. We performed *in silico* analysis to identify the potential anti-microbial peptides (AMPs) from GBPs and then validate one such candidate using *in vitro* and *in cellulo* anti-leishmanial activities. Our *in silico* analysis revealed 11 top peptides which might have potent anti-leishmanial activities. To further validate the *in silico* analysis, we synthesized the top peptide candidate and a non-cell penetrable peptide (CPP) for *in vitro* and *in cellulo* activities. We show that, the candidate GBP-derived CPP have anti-leishmanial activity in both drug sensitive and resistant strains of *Leishma niadonovani* using flow cytometry and spectrophotometry-based assays. Further we showed that the peptide is non-toxic to mammalian macrophages, keratinocytes as well as red blood cells. In celulo analysis reveal that the peptide can effectively eliminate the clinically important amastigote form of the parasite. In conclusion, our data suggests that human GBP-derived peptides can act as a promising candidate for the treatment of leishmaniasis and can help in the leishmaniasis elimination program in the near future.

Abstract ID : 062934

A BRIEF EXPOSURE TO ROTENONE LEADS TO HYPERACETYLATION OF MICROTUBULES RESULTING IN DRASTIC ELONGATION OF PRIMARY CILIA IN QUIESCENT CELLS

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Exposure to environmental toxin rotenone induces degeneration of dopaminergic neurons, which is associated with the pathogenesis of Parkinson's disease and other neurodegenerative diseases, primarily due to its effect on mitochondrial bioenergetics and generation of reactive oxygen species (ROS). However, rotenone also affects microtubule assembly dynamics and thereby blocks mitosis. We wondered whether rotenone affects primary cilia (PC) structure and function that are microtubule-based, membrane ensheathed protrusion from cell membrane present in almost all differentiated mammalian cells including neurons and is critical for signalling hub in neurons. Accordingly, dysfunction of neuronal PC is often associated with neurodegenerative diseases with impaired Sonic Hedgehog (SHH) signalling. We used hTERT-RPE1 cells that are diploid retinal pigment epithelial cells, and more than 85% of these cells assemble PC in quiescent stage, which can be achieved by serum starvation (24-48 h). Brief exposure (2-4 h) of these starved cells to rotenone at low concentration (100 nm) drastically increased PC length, along with hyperacetylation of cytoskeletal microtubules. Recent studies indicated that microtubule dynamics is controlled by post-translational modifications on tubulin, which also emerged as critical regulators of structure and function of both primary and motile cilia. Indeed, we found that elongation of PC length is due to promotion of hyperacetylation of ciliary axonemal microtubules by rotenone treatment, which is prevented when cells are depleted of α-TAT1, a α-tubulin acetyl transferase enzyme, and not affected by treating cells with ROS scavenger. The conditions of rotenone treatment in our case does not induce any alteration in mitochondrial potential. While direct binding of rotenone to microtubules is supposed to enhance microtubule depolymerisation, however, rotenone induced hyperacetylation of microtubules appears to stabilize axonemal microtubules in quiescent cells. Therefore, it is tempting to hypothesize a direct role of rotenone in promoting hyperactivity of α-TAT1 via binding to it. While several aspects of this mode of rotenone activity in affecting PC length are being studied currently in our lab, the acute rotenone treatment in serum-starved U-87MG glioblastoma cells showed 3-4 fold increase in PC length. Thus, it is likely that brief exposure of neurons to insecticide rotenone even at very low concentration may cause aberrant PC elongation which may ultimately have a causal role in neurodegeneration.

Abstract ID : 101223

EXPLORING THE CROSSTALK BETWEEN HORMONE-RECEPTOR-DEGRADING PROTEIN, CUEDC2 AND ANDROGEN RECEPTOR IN TRIPLE NEGATIVE BREAST CANCER

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Triple Negative Breast Cancer (TNBC), a highly invasive and metastatic form of breast carcinoma, is typically characterized by the absence of Estrogen Receptor (ER), Progesterone Receptor (PR) and Human Epidermal Growth Factor Receptor 2 (HER2). Nevertheless, studies demonstrated high mRNA expression of Androgen Receptor (AR) within the Luminal Androgen Receptor (LAR) subtype of TNBC. Interestingly, a hormone-receptor-degrading protein, CUEDC2 is found liable for degrading ER and PR through ubiquitin-proteasome pathway in breast cancer cells. This made us curious about the possible crosstalk between AR and CUEDC2. Here, we hypothesize that the AR might have a negative correlation with CUEDC2 expression in breast cancer and vice-versa.

We used 104 cell lines from Cancer Cell Line Encyclopedia (CCLE) and 410 patient datasets from The Cancer Genome Atlas (TCGA) to study any possible correlation between the AR and CUEDC2 expressions. We divided them into HR positive (ER+ and/or PR+), HER2 Enriched (ER-, PR-, HER2+), TNBC (ER-, PR-, HER2-), and LAR subtypes. The Pearson correlation among the cell line data did not show any significant correlation which might be affected by limited amount of data. Among the TCGA dataset, we considered the samples with comparatively higher AR expression (above median value= 9.5205). Here, the TNBC and HER2 enriched samples portrayed significant amount of negative correlation (r value >-0.96) with p value <0.005. Additionally, prostate cancer patient datasets (AR+ samples) also showed similar negative correlation between AR and CUEDC2. From these results we could highlight a potential crosstalk between AR and CUEDC2 among different subtypes of breast cancer.

Abstract ID : 125633

ENHANCING PRECISION IN GENOME EDITING: COMBINING PAIRED NICKASES WITH NHEJ INHIBITORS TO PROMOTE HOMOLOGY-DIRECTED KNOCK-IN

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CRISPR-Cas9 has revolutionized the field of genome editing by enabling precise, targeted genome editing of living cells. However, one major limitation of CRISPR-Cas9 is the occurrence of off-target effects, thereby reducing its therapeutic potential. To mitigate this issue, many strategies including paired nickases system have been developed. The paired nickases system involves two nickases working in tandem. Each nickase cleaves a single strand of the DNA, producing nicks that, when combined, result in a staggered double strand break (DSB). This strategy minimizes off-target effects by requiring both nickases to act simultaneously at closely spaced target sites (50-60 nucleotides apart). Despite the targeted introduction of DSBs, the cell's natural DNA repair mechanism often favours the error-prone non-homologous end joining (NHEJ) pathway over the more precise homology-directed repair (HDR) pathway, limiting the efficiency of precise genome edits. In this study, we hypothesized that inhibiting NHEJ would enhance HDR efficiency. To test this, we explored the use of small molecule inhibitors such as W7, NU7026, MIRIN, and SCR7, which target various proteins and co-factors involved in NHEJ. Using our in house developed cell-based reporter assay system, we implemented this strategy to enhance the incidence of HDR. Our findings revealed that NHEJ inhibitors significantly increased HDR occurrence. Additionally, we established a method for targeted genomic knock-ins by integrating the paired nickases approach with various combinations of these NHEJ inhibitors. Successful implementation of this process could pave the way for a more accurate genome engineering technique.

Abstract ID : 101929

IDENTIFICATION AND CHARACTERIZATION OF MARINE BONE DEGRADING COLLAGENASE ENZYME FROM THE BONE-EATING *OSEDAX* WORM ASSOCIATED MICROBIAL ASSEMBLAGES

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Marine ecosystems especially deep sea ecosystems are one of the last frontiers in biology. These deep sea ecosystems display a huge and formerly unexpected biodiversity. Whale falls that represent a concentrated food input into an otherwise food depleted environment in deep sea region. The whale falls are decomposed successional by a variety of organisms like crustaceans, annelids and bivalves, as well as an array of microorganisms.

A pivotal role in bone degradation is played by the annelid *Osedax* which consumes nutrients using posterior root system and its associated marine bacterial biofilms. *Osedax* has to rely on bacterial symbionts that are generally enclosed in bacteriocytes in the root tissues. In this study, I characterized the microbial assemblages associated with cow bone samples using the 16S rRNA gene sequencing. I also examined their amylase, protease, collagenase enzyme activities and checked their biotechnological potential using different temperatures. The culturable microbial communities of bone samples contain Gammaproteobacteria, Alphaproteobacteria, Epsilonproteobacteria, Flavobacteria and Bacilli dominating among them. Almost all the microorganisms secreted enzymes with collagenolytic activity even at lower temperature (5°C) and higher temperature (60°C). Collagenase enzyme was characterized in detail by both biochemical and in silico methods. U32 collagenase was identified using MALDI TOF MS/MS method. The identified enzyme could be used for industrial purposes. The activity of microbial assemblages on cow bone sample will give hints of microbial activities in whale falls that is present in deep oceans and very few limited studies have been conducted on it.

Abstract ID : 110715

VOLTAGE DEPENDENT ANION CHANEL 1 (VDAC1) REGULATES CILIOGENESIS BY ALTERING MITOCHONDRIAL FISSION-FUSION DYNAMICS

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Primary Cilia (PC) are microtubule-based, membrane ensheathed non-motile organelle found in almost all differentiated cells and serve as a sensory organ or a hub for transferring various signals. However, in dividing cells assembly and disassembly of PC is coordinated with cell cycle, i.e. PC are formed during cellular quiescence and are disassembled during mitosis. Importantly, previous studies from our lab identified two voltage dependent anion channel proteins VDAC1 and VDAC3 that are mitochondrial outer membrane proteins best known to regulate mitochondrial bioenergetics to negatively regulate ciliogenesis. Our recent study indicated that depleting VDAC1 can restore PC and puts a brake in cell proliferation in cancer-derived cells that commonly do not assemble PC.

In our quest to find out how VDAC1 and mitochondrial bioenergetics may regulate ciliogenesis, we identified a novel role of VDAC1 in facilitating mitochondrial fission dynamics. Accordingly, in VDAC1-depleted cells, mitochondrial length is significantly increasing suggesting mitochondrial fusion in asynchronously growing hTERT-RPE1 cells that are diploid non-transformed cell line widely used as cell culture model to study ciliogenesis. Most of these cells assemble PC in quiescent condition achieved by 24-48 h serum starvation. Importantly we observed that serum starvation also leads to mitochondrial fusion, while serum re-addition to the starved cells promote PC disassembly and also reverts the mitochondrial dynamics. Interestingly, treating growing RPE1 cells with mitochondrial fission inhibitor mdivi-1 significantly increasing ciliation, a phenotype similar to VDAC1 depletion. Also, inhibiting VDAC1 by specific inhibitor DIDS also increases mitochondrial fusion. Based on our preliminary data and a previous study that suggests translocation Drp1 to mitochondrial surface via binding to VDAC1 leads mitochondrial fission upon hypoxia, we are currently testing if attenuated bioenergetics upon VDAC1 depletion alters mitochondrial fission-fusion dynamics via regulating Drp1 translocation to mitochondria and thereby facilitating PC assembly and inhibiting cell cycle progression.

DEVELOPMENT AND APPLICATION OF POLYSACCHARIDE BASED COATING FOR ENHANCING THE SHELF-LIFE OF *SOLANUM LYCOPERSICUM*

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Biopolymer based food coating acts as an ecofriendly packaging alternative for extending the self-life and preserving the quality of high climacteric fruits and vegetables by controlling enzymatic browning, delaying microbial spoilage, lowering the intensity of respiration. The study aims in valorization of food bio-wastes of longan seed, pomelo peel by formulation of polysaccharides-based coating agent for delaying the post-harvest changes in tomatoes. Chemical preservative like sodium benzoate was also incorporated in the coating solution of pomelo pectin and longan starch in maintaining the freshness of the coated tomatoes. The study was conducted at an interval of 0, 3, 7 and 11th day in comparison with unwrapped tomatoes as control at 25ºC and refrigerated condition by taking in account changes in various criteria like weight loss, pH, TSS, titratable acid content, anti-oxidant activity. The study revealed that the coating formulation was successful in enhancing the self-life of the tomatoes by delaying the increase in pH, TSS and decrease in titratable acidity at different storage conditions. At 25ºC the uncoated tomatoes exhibited maximum decrease in antioxidant activity of 159.42% rather than coated tomatoes (both in absence and presence of preservative) with 132.5% and 47.54% decrease respectively, similar trend was also exhibited at refrigeration condition. Thus, careful engineering of polysaccharide based active food packages can be a new opening avenue for improving food security by reducing post-harvest food losses.

Abstract ID : 105752

DESIGNING OF A MULTI-EPITOPE AND PEPTIDE COCKTAIL VACCINE AGAINST DENGUE VIRUS: AN INDIAN POPULATION-BASED STUDY

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Dengue virus, an arbovirus leads to severe loss of lives every year in tropical and sub-tropical climate countries making research to curb virus infectivity more crucial in recent times. Although a vaccine name Dengvaxia is available for use, its low efficacy and multiple limitations make research on the same more important. Here, we have targeted the virus surface protein, the envelope protein belonging to the different serotypes of the Dengue virus to identify highly specific potential epitopes that may elicit a serotype specific and non-cross reactive immunogenic response upon introduction into the host body specifically the Indian population. HLA antigens were selected based on population analyses of the Indian population. Epitopes were screened such that they would mount a response against only the serotype from which it has been derived, since it is absent in the other serotypes limiting probability of cross-serotype activity, in turn reducing the chance of Antibody dependent enhancement of infection which is a critical feature of Dengue virus infection. Epitopes were screened for various immunogenic and physico-chemical properties. Immunogenicity analyses was performed for the vaccine formulation consisting of the selected epitopes in both peptide form as well as stitched multi epitope vaccine form, a combination which has been observed to be able to elicit the immune system better than each of the individual formulations. This study may lead to the development of a highly specific and potent vaccine formulation to combat Dengue virus infection in turn leading to significant decrease in loss of lives in foreseeable future.

Abstract ID : 100446

FERMENTATIVE VALORISATION OF COLLAGEN-RICH FLESHING WASTE OF LEATHER PROCESSING FOR THE ECONOMICAL PRODUCTION OF POLYSACCHARIDE CHITOSAN: A NOVEL BIOTECHNOLOGICAL APPROACH

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Through the generation of significant employment and foreign exchange, leather industry established its significance in Indian Economy. Globally ~6800000 tons of rawhide are processed every year; only ~20% of it, is transformed into leather, rest are discarded as waste. Fleshing is one of the major solid wastes generated during leather processing. Every year ~980,000 tons of fleshing waste are produced worldwide. Most of these are dumped at landfill sites due to lack of suitable utilization processes. Here we propose a scalable process to produce protein-hydrolysate (PHz) from collagen-rich fleshing waste of leather processing. Prepared PHz was characterized using UV-Vis, FTIR, and Solid-State-C^{13}-NMR, MALDI-TOF-MS, DLS, TGA, DSC, SEM and HPLC. Combination of 0.3% yeast-extract, 1% PHz, and 2% glucose were found to be best media composition for the fermentation of three well-known chitosan producing zygomycetes group of fungi. The maximum yield of chitosan (335 mg/L) and biomass (2.74 g/L) was obtained from *Mucor sp.* 1.53 g/L of biomass, and 239 mg/L of chitosan was produced by *Rhizopus oryzae*. The same for *Absidia coerulea* was found 2.05 g/L and 212 mg/L, respectively. Quality of isolated chitosan(s) was assessed by Solid-state-C^{13}-NMR and FTIR analysis. Molecular-weight of isolated chitosan(s) was found >350 Kda with ~85% degree-of-de-acetylation. Furthermore, isolated chitosan(s) were comprehensively characterised by XRD, DLS, TGA, DSC, and SEM analysis to apprehend their physico-chemical nature. Isolated chitosan(s) were found hemocompatible and non-cytotoxic in the form of nanoparticles. The product(s) have also shown significant antioxidant activity in following order; Chitosan-Ac > Chitosan Ro > Chitosan-Mr.

Abstract ID : 114343

UNDERSTANDING MODULATION OF GLYCOLYTIC FACTORS UNDER POLYCYSTIC OVARIAN CONDITION: A COMPARATIVE ANALYSIS BETWEEN OVARY AND LIVER TISSUES

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Polycystic ovary syndrome (PCOS) is a multifactorial disorder characterized by hyperandrogenism, anovulation/oligo-ovulation and insulin resistance (IR). Elevated expression of the androgen receptor (AR) under PCO condition has both reproductive as well as metabolic implications. AR situationally associates with glycolytic factors like insulin like growth factor-1 (IGF-1) and phosphoglycerate kinase 1 (PGK-1), leading to differential glycolysis. The granulosa cells (GCs), which surround the developing ovum are involved in a delicate play of hormones, - which is dysregulated in PCOS. Utilizing an established *in-vitro* PCOS model system comprising of mouse granulosa cell line, KK-1; our study showed differential expression of the glycolytic enzymes PGK-1 and GAPDH under PCO condition at both transcript and protein level. Further, increased nuclear localization of AR and its co-localization with PGK1 was detected under PCO condition. GLUT-4, a glucose transporter implicated in PCOS associated IR, as well as IGF-1 have been observed to be upregulated under PCO condition. PCOS mediated IR can affect the steroidogenic function of the liver, the major organ dedicated to glucose metabolism, leading to exacerbation of hormonal imbalances. *In-vivo* studies performed on rat liver and ovarian tissues revealed downregulated GAPDH expression in both PCO liver and ovary. While, PGK-1 and GLUT-4 were differentially expressed i.e. upregulated in the PCO ovaries while downregulated in the liver tissues compared to control, suggesting an altered glycolytic state at both systemic and the local ovarian level. The work also demonstrates the therapeutic potential of thymoquinone (TQ), in amelioration of PCO condition and associated symptoms in the ovary.

INTEGRATION OF TRANSCRIPTOME AND METABOLOME SIGNATURES FOR THE DEVELOPMENT OF MACHINE LEARNING BASED CLASSIFICATION MODEL OF PULMONARY SARCOIDOSIS

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Pulmonary sarcoidosis is a disease of unknown cause, marked by the formation of noncaseating granulomas in the lung tissue. This study integrates metabolomic and transcriptomic data, utilizing a machine learning approach to identify key metabolic and genetic changes, along with their associated pathways, in sarcoidosis patients. Serum metabolites were identified in two patient groups (discovery and validation cohorts) using proton nuclear magnetic resonance (1H-NMR) analysis. In parallel, transcriptomic data from blood samples were analyzed using the Gene Expression Omnibus (GEO) database to identify differentially expressed genes. A machine learning model was then developed to assess the predictive capacity of the altered metabolites and transcripts in distinguishing sarcoidosis cases. The IMPaLA tool (version 13) was used to explore integrated pathways linked to these key features.

Five metabolites were significantly altered in sarcoidosis patients compared to controls, and transcriptomic analysis identified 20 dysregulated genes. The predictive accuracy of the classification model was 94% based on metabolites and 92% based on transcripts. Integration of metabolomic and transcriptomic data highlighted the JAK STAT signaling pathway as significantly associated with sarcoidosis. Overall, the study points to disruptions in energy, amino acid, and lipid metabolism, alongside dysregulated inflammatory pathways, in sarcoidosis patients. These findings contribute to a better understanding of the molecular mechanisms underlying sarcoidosis and may offer potential biomarkers for disease diagnosis and therapeutic targets.

Abstract ID : 055153

INTERPLAY BETWEEN PROTEIN MISFOLDING DISORDERS AND PARKINSON'S DISEASE: MECHANISTIC INSIGHTS AND IMPLICATIONS

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Parkinson's disease (PD) is the second most common neurodegenerative disorder, a terrible burden for our society, as it is age-related, progressive, currently incurable and eventually fatal. PD is characterised by the loss of dopaminergic neurons in the substantia-nigra pars compacta region of the brain and the presence of Lewy bodies comprised of abnormal aggregates of alpha-synuclein (α Syn) protein. Marketed drugs offer for symptomatic treatment, yet no disease-modifying therapeutic is available. To develop disease-modifying drugs, thorough understanding about the disease mechanism is essential. Growing evidence suggests that various protein-misfolding diseases develop much earlier and may have implications in PD progression. We therefore, selected a few such diseases including type-2 diabetes mellitus (T2DM: hIAPP & insulin), Alzheimer's disease (AD: Aα & tau). We picked α Syn mutants E46K, A53E and G51D, most pathogenic form in Familial PD. In this study, we performed molecular docking to investigate the interaction between α Syn (WT and the mutants) and other amyloidogenic proteins (hIAPP, insulin, Aβ and tau).

We observed a significant change in binding free energy (kcal/mol) of the "hIAPP-α Syn" interaction (-49.46[A53E] & -37.92[WT]), "insulin-áSyn" interaction (-21.79[G51D] & -41.51[WT]), "Aβ-α Syn" (-43.77[E46K] & -39.62[WT]) and "tau-α Syn" (-31.89[E46K] & -22.74[WT]). Our results suggest that the likelihood of developing sporadic-PD is higher in T2DM (hIAPP) or in AD (Aβ & tau) than developing familial-PD. However, insulin-α Syn interaction results indicate that familial-PD may be predominant over sporadic-PD in insulin-resistant T2DM. However, these results need further experimental validation.

Abstract ID : 054532

ACTIN FILAMENT SEVERING MECHANISM PROMOTES PRIMARY CILIA ASSEMBLY

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Primary Cilium (PC), a microtubule-based membrane-ensheathed cell-surface exposed non-motile resilient sensory organelle, functions as 'cellular-antenna' by transducing developmental signaling and maintaining tissue-homeostasis during cellular quiescence. Mutations in ciliary genes provoke an array of genetic disorders termed as 'ciliopathies'. Recent studies have indicated that ciliogenesis is influenced by actin cytoskeleton dynamics and its regulatory proteins. A genome-wide siRNA-screening hinted that actin-interacting WD-repeats-containing protein Wdr1 which heightens severing of cofilin-decorated actin filaments, causing rapid turnover of F-actin, as a potential regulator of PC assembly. We have characterized the cellular localization of Wdr1 and validated the hint.

Our study in ciliogenic model human RPE1 cells revealed that Wdr1 is predominantly a cytoplasmic protein, often co-localizes with apical actin-meshwork but not with stress-fibers, centrioles or PC. During serum-starvation when actin dynamics is reduced, Wdr1 level increases and serum-restimulation lowers it. Depleting Wdr1 using specific siRNAs significantly increases the apical actin-meshwork and stress-fiber formation and remarkably reduces ciliation and cilia-length during PC-permissive state. siRNA-resistant construct of Wdr1 reverses the depletion phenotype of cilia-loss. Cytochalasin D, an actin depolymerising agent, overturns the defects in ciliogenesis and rigidity of cortical actin-meshwork. Recruitment of Rabin8, a membrane-trafficking regulator, to the basal-bodies during ciliogenesis was also impaired upon Wdr1 depletion but removal of CP110 cap, an inhibitor of PC-assembly, was not hindered. Thus, our data establishes that Wdr1 regulates PC-assembly, likely via altering actin dynamics at the apical region. Next, we will determine if clinically-important WDR1 mutations may affect ciliogenesis, to suggest the translational value of this regulatory pathway.

Abstract ID : 060843

ENHANCING PHYTOREMEDIATION OF HEAVY METALS WITH PLANT GROWTH-PROMOTING BACTERIA ISOLATED FROM CHICKPEA ROOT NODULES

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Industrialization, agricultural practices, and other human activities have led to the contamination of soils with heavy metals, which pose serious risks to animal, plant, and human health. Remediation of these pollutants is therefore essential. Phytoremediation is more eco-friendly than chemical methods for heavy metal remediation due to its natural, sustainable approach. The efficiency of phytoremediation can be further enhanced through the use of plant growth-promoting (PGP) bacteria. Certain plant growth-promoting bacteria (PGPB) form mutualistic relationships with plants to improve growth, particularly in heavy metal-stressed environments. Heavy metal-resistant PGPBs thus offer a promising approach to improving plant health in contaminated soils and are now explored as commercial biocontrol agents and plant growth enhancers. In this study, the bacteria were isolated from chickpea root nodules, and their genetic identification was determined via 16S rRNA sequencing. To evaluate their heavy metal (HM) tolerance, chromium (Cr) was used as a source of HM, and resistance to other metals such as arsenic, cadmium, lead, zinc, cobalt, and copper was also evaluated. Additionally, their minimal inhibitory concentrations (MIC) for Cr, biofilm formation, extracellular polysaccharide (EPS) production, DPPH antioxidant activity, and PGP traits were evaluated. While PGP activities declined with increased heavy metal stress, these strains show promise for enhancing soil-plant systems and warrant further study to confirm their efficacy in bioremediation applications.

MOBILE PHONE RADIATION INDUCES DIABETIC LIKE ALTERATIONS IN SWISS ALBINO MICE

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Diabetes is a predominant metabolic disease that humans are suffering since ages. On the other hand, the number of mobile phone users is increasing daily. Reports suggest at homologous predisposition of diabetes due to the exposure of radiation from mobile phone.

Comparison of the alterations in radiation exposed and chemically induced diabetes mice group.

Swiss albino mice were used as study model and grouped as control, diabetic, and radiation exposed (1h, 2h and 3h per day) groups for 4 months, each group comprises 4 animals. Regular monitoring of blood glucose and Novel Sucrose Preference Test (SPT) were performed. Post treatment, the animals were sacrificed and tissues like liver, kidney and pancreas were isolated for histopathological studies and expression of GLUT1 and KCNJ11 mRNA via qRTPCR.

The post-prandial blood glucose was significantly different between diabetic and 3h radiation exposed group. The reliability of SPT was assured (Chronbach α = 0.896) although there was no significant difference in the sucrose preference among diabetic and non-diabetic groups. Trichrome staining revealed collagen deposition in kidneys, PAS staining showed depletion of glycogen storage in liver, H/E staining shows reduced size of islets in pancreas of diabetic and 3h exposed group as compared to control. RNA expression validates expression of diabetic marker in liver, pancreas and kidney of diabetic induced group.

Study indicates many significant similarities between the diabetic condition and mobile phone exposure. These findings suggest that radiation emitted from mobile phones can be one of the causes in progression of diabetes.

Abstract ID : 013806

DEVELOPMENT OF STRIP-BASED DIAGNOSTICS FOR THE DETECTION OF DEADLY FREE-LIVING AMOEBAE

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Free-living amoebae (FLAs) are single-celled protozoa commonly found in soil and water environments, with the unique ability to survive extreme conditions. While most FLAs are harmless, species such as *Acanthamoeba sp.*, *Balamuthia mandrillaris*, *Naegleria fowleri* are known to cause life-threatening infections in humans, including Primary amoebic meningoencephalitis (PAM), Granulomatous amoebic encephalitis (GAE), and Balamuthia amoebic encephalitis (BAE). Additionally, *Acanthamoeba* can cause corneal infections in contact lens wearers, particularly those with weakened immune systems. These infections are often misdiagnosed due to their similarity to other common illnesses, leading to a high mortality rate.

To address this challenge, we tried to develop a rapid, cost-effective, and accurate point-of-care detection system to identify FLAs in both patient samples and environmental water sources. The system operates in two phases: the first phase involves multiplex-recombinase polymerase amplification (RPA) to detect FLAs, followed by a strip-based lateral flow detection method. The detection kit will be utilized to test water bodies in northeastern India, where FLAs are prevalent, and to raise awareness about these dangerous parasites.

As there are no current drug treatments for FLA infections, prevention through early detection is critical. The strip-based lateral flow system will help ensure the safety of swimming pools and recreational water bodies by providing a practical monitoring tool. Public awareness, combined with regular testing and certification of water bodies, will be essential in preventing outbreaks of these life-threatening infections. This system holds promise for the effective control of FLA-related diseases, particularly in high-risk regions.

Abstract ID : 121129

IMMUNOMODULATORY POTENTIAL OF URSOLIC ACID AUGMENTS ANTILEISHMANIAL IMMUNE RESPONSE DURING *L. DONOVANI* INFECTION

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One of the hallmark immunological characteristics of visceral leishmaniasis (VL), caused by *Leishmania donovani*, is profound immunosuppression. Due to several obstacles, such as high costs, adverse side-effects, and growing resistance, there are currently few chemotherapeutic compounds available to treat VL. In this light, it will be highly revolutionary to devise a new immunomodulating agent capable of reversing Th2-Th1 immunological imbalance and so aid faster healing and in lowering relapses. The current study aimed at identifying possible treatment options against *L. donovani*, and understanding of the shared drug targets in the Trypanosomatidae family. The investigation identified thirteen potential druggable targets in diverse species of Trypanosomatidae. The in-silico study revealed that ursolic acid (UA) shows a great binding affinity with the four of the putative therapeutic targets of *L. donovani.* Our in-vitro results shows that UA effectively reduces the survival of parasite in promastigote form as evidenced by microscopic and spectroscopic observation. Further killing of amastigotes in infected macrophages were confirmed through Giemsa staining and with potential anti-leishmanial effect in lower IC50 value. UA has been shown to induce NO generation along with decreased levels of Th-2 cytokines and elevated expressions of Th-1 cytokines in infected macrophages. During in-vivo study in BALB/c mice infected with *L. donovani*, UA treatment distinctly enhanced T-cell proliferation and IL-2 expression in splenocytes in non-toxic dose with subsequent decrease in hepatic and splenic parasite burden. Overall, our study highlighted the significant drug targets among the family of trypanosomatidae parasites and demonstrated UA's possible effectiveness against *L. donovani.*

Abstract ID : 014900

ANALYZING THE BIOREMEDIATION POTENTIAL OF BACTERIAL STRAINS ISOLATED FROM THE DENIM WASTEWATERS OF CHATTA, KALIKAPUR, WEST BENGAL

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The textile industrial sector, over the years has been the predominant contributor of large-scale water body pollution, due to the expulsion of textile effluents in the form of undegraded dye, detergents, heavy metals, and other end products. These undegraded dye products are recalcitrant in nature and therefore cannot be easily removed from the polluted water body. As a result of this, the ecological balance of the aquatic system as well as the lives of the local inhabitants are severely hampered. In West Bengal, Chatta, Kalikapur, is one of the largest denim factory hubs of the state, and has been experiencing similar problems for the past few years, since more than 80% of the canal water in this region is contaminated with denim effluents. To address this concern, we have isolated eight microbial strains from the canal water of Chatta, on the basis of their capacity to degrade indigo carmine, one of the major dyeing agents in these factories. The isolated strains exhibit unique morphologies and are capable of degrading the dye both in solid and liquid media. Additionally, some of these strains demonstrated the capacity to degrade agar, that was further confirmed by iodine assay. The strains that possess agarolytic activity might also be capable of nitrogen fixation and phosphate solubilization, since they grow readily on Jensen's and Pikovskaya media. Cumulatively, these data suggest that further investigation of these strains and their application in the dye effluent contaminated areas of Chatta might provide an effective solution to the critical situation.

Abstract ID : 061332

VITAMIN D3 INDUCED SHIFT TO M2 POLARIZATION ATTENUATES THE M1 PHENOTYPE: INSIGHTS INTO THE ROLE OF VITAMIN D3 IN MURINE MODEL

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Vitamin D3, a fat-soluble vitamin is critical for bone health and immune function, yet its effects on macrophage polarization present a complex narrative. Macrophages display a range of phenotypes, notably pro-inflammatory M1 and anti-inflammatory M2, which are vital for regulating immune responses. While some studies suggest that vitamin D3 promotes M2 polarization, enhancing tissue repair, other research indicates it may also support M1 activation, potentially worsening inflammatory diseases. This study investigates the influence of vitamin D3 on murine macrophage polarization, focusing on its mechanistic pathways.

Preliminary findings reveal that vitamin D3 treatment can shifts macrophages towards the M2 phenotype, marked by increased expression of anti-inflammatory markers and enhanced phagocytic activity. These results support the notion that vitamin D3 can guide macrophages towards a healing-oriented immune state under specific conditions. However, the relationship is complicated; varying levels of vitamin D3 and distinct inflammatory environments can affect macrophage behaviour, either facilitating recovery or exacerbating inflammation. Additionally, the presence of different diseases may modify macrophage responses to vitamin D3.

Further research is needed to clarify the molecular mechanisms by which vitamin D3 influences macrophage polarization and to explore its implications for immune regulation in health and diseases. This study emphasizes the need for a nuanced understanding of vitamin D3 in immunology and its potential as a therapeutic agent in managing inflammatory conditions and optimizing immune function.

Abstract ID : 055558

IDENTIFICATION OF NOVEL INHIBITOR CANDIDATE TARGETING HIV-1 NEF PROTEIN USING DRUG REPURPOSING APPROACHES

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Negative Factor (Nef), the largest accessory protein of HIV-1, plays several crucial roles in disease progression and pathogenesis. The main functions of this protein is downregulation of immune cells like CD4+ T cell, MHC-I cell, enhancing the viral infectivity. It interacts with different host kinases (Hck and Pak2) which in turn facilitates the protein functions and cause immune evasion. Reports proposed that in absence of full or truncated Nef protein, many functions of HIV-1 got impaired. Hence, in recent years this protein become interesting antiretroviral drug target. In this study, we have selected most prevalent 4 HIV-1 subtypes (A, B, C and D) and modelled them using template PDB 4U5W. 3 consecutive MD simulations were executed and clustered to identify different conformation of Nef protein from individual subtypes. Total 26 different conformations (8 from subtype A, 4 from subtype B, 6 from subtype C and 8 from subtype D) were selected and RMSD of the stable pocket region (77-153) has been determined between them. 1400 molecules from ZINC 20 database were then docked with these 26 conformations individually and 4 molecules were selected. These 4 molecules were then re-docked with the conformations and the stability of the docked complexes were validated using simulation study. Post simulation analysis identifies one molecule possess satisfactory results with all the conformations and hence, we proposed this compound to be repurposed targeting HIV-1 Nef.

Abstract ID :040204

COMPUTATIONAL PREDICTION OF STRUCTURE FOR FULL-LENGTH TOPOISOMERASE-I FROM BUDDING YEAST

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Despite all the technological developments, determining protein structures by experimental means still remains labour-intensive. Thus, computational ability to accurately predict protein structure from protein sequence is a landmark achievement in scientific research. Topoisomerase-I (Top1) is a crucial enzyme involved in removal of DNA torsional stress and in maintenance of genome integrity. It is an important cellular target for drug-design. Availability of 3-D structural information of Top1 or any protein is the prerequisite to perform *in-silico* studies related to molecular docking/drug-designing/interactome screening. However, our knowledge about the three-dimensional structure of eukaryotic Top1 is limited. Budding yeast Top1, which is highly similar to the human counterpart, is a 769 residue-long, monomeric protein. Structural information of only a smaller fragment (141-373 residues) is available in RCSB-PDB database. Even the AI system-AlphaFold predicted structure for Top1 lacks information for its N-terminal domain, shown to be important for mediating interaction with various cellular proteins, including RNA polymerase. Thus, we attempted to predict a more reliable 3D structure for full-length yeast Top1 via advanced template-based modeling approach. Five domain-specific informations were gathered, and structures were predicted separately by structure predicting programs (Ab initio, RoseTTa etc.). Top five models for each domain (from each program) were then selected and further screened through structure validation parameters like PROCHECK, Verify3D, etc. Top models for each domain were assembled to build full-length model using Modeller program. Best potential model for full-length yeast topoisomerase I was finally selected on the basis of multiple layers of selection parameters.

Abstract ID : 095252

SYNERGISTIC EFFECT OF NEEM *(AZADIRACHTA INDICA)* AND HONEY AS AN EFFECTIVE ORAL IRRIGANT IN DENTAL PROCEDURES

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Dental procedures, particularly in endodontics, begin with the creation of a sterile environment within the oral cavity. Among the different chemical reagents for oral irrigation, sodium hypochlorite is the most popular choice because of its strong antimicrobial activity and disinfecting properties. However, the main drawback of sodium hypochlorite is its repugnant taste, making it generally very poorly tolerated by patients, and its cytotoxicity which may tend to attack the structural integrity of the tooth. This necessitates the search for new herbal alternatives having little to no side effects. Neem (*Azadirachta indica*) is a renowned medicinal plant native to South Asia. The leaves of this tree are a potent antimicrobial agent, acting against a wide variety of pathogenic bacteria. Various laboratory experiments have confirmed that Neem can be used as an alternative of sodium hypochlorite in endodontics. However, it is also known for its bitter taste, thereby restricting its application through the oral route. Honey, a naturally sweet product produced by bees, is also renowned for its antimicrobial properties. The potential for honey's application in endodontics has also been verified recently. This study checked the effectiveness of a concoction of Neem leaf extract and honey as a biocompatible alternative of sodium hypochlorite. From the bacterial culture of the dental pulp, antibacterial inhibition was assessed using the agar well diffusion method. Bacterial inhibition zones around each well were recorded. The highest inhibitory zone against bacteria was seen in the combinatorial treatment of Neem and honey as compared to sodium hypochlorite. Hence, the concoction of Neem and Honey can be used effectively as dental irrigating solutions. Further *in vivo* research is on the way to test this oral irrigant for acceptability by patients.

STUDY OF ANTIBIOFILM ACTIVITY OF BIOGENIC SILVER NANO CONJUGATE FROM *LEONURUS SIBIRIUCS* LEAVES AGAINST *STAPHYLOCOCCUS AUREUS* ATCC 23235

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Sta phylo cocccus aureus, an opportunistic pathogen, causes medical-device-associated infections by forming robust biofilms. Since such infections cannot be treated by available antibiotics due to the non-accessibility of biofilm matrix encased sessile cells, exploration of some alternative therapeutic measure becomes the need of the hour. Although *Leonurus sibiricus*, an indigenous plant is known to have several beneficial activities, no literature on its antibiofilm activity against *S.aureus* is available. Since, nano silver has a long history of usage in health care, in the present study, silver nanoconjugates (AgNCs) formed by the phytoextract from *L.sibiricus* leaves were characterized by UV-Vis spectroscopy, dynamic light scattering, zeta potential, scanning electron microscopy, energy dispersive X-ray and colour mapping. The AgNCs possessed spherical shape with diameter between 21.04nm-84.42nm and zeta potential of -28.9mV, signifying their high stability. All process parameters for AgNC biosynthesis were optimized using Response Surface Methodology and validated by Artificial Neural Network. These AgNCs possessed a minimum biofilm eradication concentration as low as 25μg/ml and reduced 90.033±0.049% biofilms of *S.aureus* ATCC 23235. The sessile cells were irreversibly destroyed by the AgNCs as confirmed by flow cytometric analyses and confocal laser scanning electron microscopy. Fourier Transformed Infrared Spectroscopy detected significant modifications of functional groups of EPS components of treated cells and the cellular deformity was confirmed by SEM images.

Abstract ID: 045052

THERAPEUTIC POTENTIAL OF *HELIANTHUS ANNUUS* SEEDS: A NATURAL REMEDY FOR DIABETES AND RELATED COMPLICATIONS

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Helianthus annuus (sunflower) seeds are traditionally valued for their medicinal properties, yet their potential in addressing chronic medical conditions, like diabetes, remains underexplored. This study bridges the gap by evaluating the antioxidant and antidiabetic effects of *Helianthus annuus* seeds in experimental models. The study aimed to scientifically validate the therapeutic efficacy of sunflower seed extracts, focusing on its role in mitigating oxidative stress and diabetes-related complications. Hydroalcoholic extracts of defatted sunflower seeds were prepared and subjected to phytochemical screening. *In vitro* assays, including 1,1-diphenyl-2-picrylhydrazyl (DPPH) and nitric oxide (NO) radical scavenging, were used to assess antioxidant properties. Glucose uptake was measured using HepG2 and L6 cell lines. *In vivo*, high-fat diet and streptozotocin-induced diabetic Wistar rats were treated with the extracts to assess antidiabetic efficacy. The extract exhibited significant dose-dependent antioxidant activity, with IC_{50} value of 12.5 µg/mL in DPPH assays. Glucose uptake in HepG2 and L6 cells treated with the extract increased by 61.13% and 77.31%, respectively, when compared with respect to the negative control. Furthermore, dose-dependent gradual reduction in the level of phosphorylated Protein Kinase C was also reported in HepG2 cell line. In diabetic rats, the extract (400 mg/kg) significantly reduced fasting blood glucose levels ($P<0.001$), comparable to Metformin. Lipid profiles and body weight were also improved. *Helianthus annuus* seeds exhibit potent antioxidant and antidiabetic activities, suggesting their potential as a natural therapeutic agent for managing diabetes and related complications. Further exploration of bioactive compounds could offer insights for developing novel therapeutic targets.

ABSTRACT ID: 023314

REPURPOSING AN ANTI-PSYCHOTIC DRUG IN CANCER THERAPY: A MOLECULAR DOCKING AND DYNAMIC SIMULATION STUDY

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The Translationally Controlled Tumor Protein (TCTP) is a highly conserved protein crucial for early development and various cellular processes, including cell cycle regulation, apoptosis, DNA repair, genomic stability, and stress response. TCTP overexpression is strongly associated with numerous cancers, positioning it as a promising alternative therapeutic target. The antidepressant and antipsychotic SSRI drug sertraline has the potential to destroy and prevent tumor growth by functionally inhibiting TCTP. However, the exact mechanism of action is still elusive. This study investigates the molecular interaction between sertraline and TCTP using an *in-silico* approach. The NMR solution structure of TCTP (PDBID: 2HR9) and the 3D structure of sertraline (PubChemCID 68617) were energy minimized and ligand binding active sites on TCTP were determined to perform docking studies, followed by molecular dynamic simulations. Docking results revealed sertraline interacts with flexible-loop and helix-1 regions of TCTP with a binding energy of -6.3kcal/mol. A 100ns MD simulation of the TCTP-sertraline complex showed a 1.7-fold reduction in RMSF in the flexible-loop and helix-1 regions after 50ns run, suggesting that sertraline binding decreases flexibility and induces structural changes. Importantly, the molecular docking study demonstrated that sertraline targets key amino acids of TCTP, involved in binding and antagonizing the pro-apoptotic functions of p53, Bcl-XL, and Mcl-1. The binding of sertraline to these regions of TCTP significantly disrupts the latter's interaction with its pro-apoptotic protein partners by reducing non-bond interactions. This could offer an alternative therapeutic strategy in psychologically depressed cancer patients to target 'TCTP' where its oncogenic functions are upregulated.

Abstract ID: 112531

NUTRITIONAL AND PHYTOCHEMICAL COMPARISON OF CHICKPEAS AND MUNG BEANS: ANTIOXIDANT, ANTIMICROBIAL AND HEALTH BENEFITS

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Legumes, such as chickpeas (*Cicer arietinum*) and mung beans (*Vigna radiata*), are rich in nutrients and have various health benefits, including supporting immune function and preventing illness. Chickpeas and mung beans (Fabaceae) are high in protein, carbohydrates, and minerals, and contain phytochemicals with anti-inflammatory, antioxidant, and anticancer properties. The nutritional profiles and bioactive characteristics of chickpeas and mung beans differ, with chickpeas being high in macronutrients and it includes vital amino acids, polyamines, and allelopathic chemicals. The study compared the nutritional content and bioactive properties of chickpeas and mung beans in different forms. The methods used in the study included : Vitamin-B1 and Vitamin-C quantification assay by using the potassium iodate and potassium iodine titration method, protein estimation by UV spectrophotometric method, through Bradford assay and Lowry assay, carbohydrates measurement through the anthrone method, antibacterial assay using the Kerby-Bauer disc diffusion method against *Escherichia coli* and in vitro antioxidant estimation using DPPH free radical scavenging assay. The results showed that crushed chickpeas have higher Vitamin-C and Vitamin-B1 content, while soaked mung beans have higher protein content. Chickpeas have stronger antioxidant activity in seeds, while mung beans have stronger antioxidant activity in sprouts. The microbial efficacy of chickpeas is higher in seeds, while mung beans have higher microbial efficacy in sprouts.

Abstract ID: 095259

TARGETING SIGNALLING PATHWAYS IN CERVICAL CANCERS BY ALL-TRANS RETINOIC ACID (ATRA)

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Cervical cancer is the second most common cancer in Indian women and a major global cause of mortality. Modern treatments like chemotherapy and radiotherapy have appreciably increased survival rates but are costly and show side effects like myelosuppression, anaemia, fatigue and nausea. As using natural phytochemicals could provide alternatives to such treatments, we studied the anti-tumorigenic potential of all-trans retinoic acid (ATRA), a naturally occurring metabolite of retinol found in carotenoid rich fruits and vegetables. Computer based studies indicated ATRA showed good binding affinity and interactions (by hydrogen bonding and non-polar interactions) with molecules important in cellular signalling pathways like phosphatidylinositol 3^1 kinase (PI3K), focal adhesion kinase (FAK) and mitogen-activated protein kinase (MAPK) with binding affinity of ATRA comparable to or higher than that of synthetic inhibitors Alpelisib, Defactinib and BIRB796 respectively. Computer based studies also indicated the suitability of ATRA as potential drug molecule with low toxicity. ATRA showed good binding affinity and interactions with MMP-2 and MT1-MMP in comparison to synthetic inhibitors like Marimastat. Treatment of the metastatic human cervical cancer cell line HeLa with different concentrations of ATRA caused appreciable downregulation of signalling molecules like FAK and p-PI3K and also MMP-2, MT1-MMP expression and MMP-2 activity. Our studies thus indicate that ATRA has good potential for targeting PI3K, FAK and p38MAPK mediated signalling for downregulating MMPs. Downregulation of MMP-2 and MT1-MMP would inhibit tumour metastasis. Targeting these cellular signalling pathways with ATRA could provide a novel strategy to treat cervical cancers with possibly fewer side effects.

CHEMICAL SCIENCES

Abstract ID : 081914

DNA-BINDING BY FUNCTIONALIZED GOLD NANOPRISMS: INSIGHTS FROMSPECTROSCOPIC, PHOTOPHYSICAL, AND THEORETICAL PERSPECTIVES

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DNA-nanoparticle interactions are a fascinating area of research that bridges nanotechnology, biochemistry, and molecular biology.The electrostatic attraction between the negatively charged DNA and positively charged functionalized (L-Tryptophan) gold nanoprisms (L-Trp@GNP) can enhance binding efficiency. Acomprehensive investigationregarding the interaction between calf thymus DNA and L-Trp@GNPby various spectroscopic techniques have been employed. UV-Visible spectroscopic studies revealed theperturbation of the absorbance spectra of DNA in presence of L-Trp@GNP demonstrating the binding phenomenon. Emission spectroscopy-based fluorescence analysis further elucidated the quenching of intrinsic fluorescence of the DNAupon interaction with L-Trp@GNP and the mechanism of this quenching process was found to be static/ dynamic in nature. The binding constants and thermodynamic parameters associated with the complexations abovewere computed to quantify the strength of interaction and the major driving forces responsible for the interactions. Furthermore, thermal melting and circular dichroism (CD) spectroscopy were employed to provide the insights into the effect on secondary structure of DNA upon interactions with L-Trp@GNP. These interactions have significant implications for fields such as drug delivery, biosensing, and nanomedicine, where the interaction of nanoparticles with biomolecules can play a crucial role.

Abstract ID : 074439

A MECHANISM-BASED DESIGN AND CLICK CHEMISTRY MEDIATED SYNTHESIS OF 3D PROTACS TRIGGERING APOPTOSIS IN COLORECTAL CANCER

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PROteolysis Targeting Chimeras, commonly referred to as PROTACs are hetero-bi-functional molecules that usually function to bring protein degradation via a distinctive vicinity-based mode of action known as ubiquitination. Here in our work, we modified the traditional hetero-bifunctional PROTAC moieties to hetero-trifunctional PROTAC moieties (3D PROTACs). The 3D PROTACs exhibit two dissimilar ligands for their respective protein targets and another moiety that employs an E3 ubiquitin ligase joined by two triazole linkers to form a quaternary complex inside the cancer cells which will be recognized, ubiquitinated, and degraded by the Ubiquitin Proteasome System (UPS). To identify appropriate protein targets, we applied an AI-based Network Pharmacology approach on differentially expressed genes, using microarray analysis and K-nearest neighboring for the most connected genes, from that data, we retrieved the top two most connected proteins, Histone-deacetylase (HDAC) and Glucocorticoid Receptor (GR). Deciphered to the field of Machine Learning (ML), mechanism-based QSAR can be perceived as an administered approach for needful training and test data, combined with multiple regression analysis we predict, design, and synthesize 12 new compounds as HDAC targets connected with a linker. But ligands for GR are not much to make a training set out of, so we applied ML-assisted binder prediction on 973 phytochemicals of known activity by applying support vector machine algorithm coupled with molecular docking to obtain 5 leads. Our 3D PROTACs induce apoptosis at the nano-molar level against colorectal cancer cell lines and reveal the benefit of combining AI/ML in PROTAC development.

Abstract ID: 124829

SYNTHESIS OF FUNCTIONAL POLYMER COMPOSITE FOR FLEXIBLE ELECTRONICS AND STORAGE DEVICES BY IRON(III) AND COPPER (II) BASED METAL-ORGANIC COMPLEXES

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"Flexible electronics" is developing as a highly interdisciplinary and disruptive technology that has been drawing significant consideration from multiple fields. It involves by depositing organic, inorganic, and organic-inorganic composite (hybrid) materials on flexible substrates to form electronic (optoelectronic, photonic) components and their combined systems. The present work involves the fabrication of magnetic and electric nanoparticles by iron(III) and copper (II) based metal-organic complexesusing room temperature and high temperature methods and followed by their incorporation into siloxane polymer matrices, and the evaluation of the resultant composites' electrical, magnetic, and mechanical properties. The goal is to achieve a material having high performance in electronic applications along with the maintaining the flexibility and the durability, making it suitable for advanced, wearable, and flexible electronic devices.

SUPERSYMMETRIC QUANTUM MECHANICS AND DARBOUX TRANSFORMATION: A COMPARISON

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The main object of this work is to study the two types of factorization method, Supersymmetric (SUSY) quantum mechanics and Darboux transformation, in some commonly encountered model potentials and also compare the two methods in terms of their usefulness. Unlike previous approaches where the superpotential or the Darboux potential are derived from ground eigen state wave function or simply guessed, we have solved or at least tried to solve analytically the Riccati equation, a first order non-linear differential equation for the superpotential or Darboux potential, and from that solution (if obtained), generate the ground state wave function and then the eigen spectra of both the Partner (SUSY or Darboux) Hamiltonians. Here, it may be noted that, we have used this formulation to bypass the task of solving the Schrödinger equation, a second order differential equation, and thus if the solving procedure of Riccati equation leads to second order differential equation resulting from some substitution of variables, we have not proceeded for it further. Comparative study of these two methods reveal that the usefulness of the methods is highly system specific as in some cases, both the methods give useful results while in some other case, one of them. Here, based on our study of model potentials, SUSY quantum method is more useful compared to Darboux transformation.

Abstract ID: 033842

GRAPHENE QUANTUM DOTS AS RATIOMETRIC FLUORESCENT SENSOR FOR LACTIC ACID

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In this work, Graphene Quantum dots (GQDs) were synthesized, characterized, and explored as a fluorophore in sensitive determination of lactic acid. In the present study, GQDs were prepared by pyrolysis of aspartic acid in glycerol medium. The characterization of the prepared GQDs was investigated using Fourier-transformed infrared spectroscopy, Transmission electron microscopy, X-ray photoelectron spectroscopy, and Zeta potential measurements. A ratiometric fluorescence probe towards lactic acid with a good linear range of 7.389-65.217 µM and limit of detection (LOD) of 5.846 µM is developed. The development of ratiometric fluorescence instead of monochromatic fluorescence improves the stability and accuracy of the detection method.The developed probe was applied to lactic acid detection in human serum with satisfactory results, indicating that the probe has enormous potential in clinical practice. The sensing capacity of the GQDs was further validated in presence of various interfering agents such as ascorbic acid, citric acid, nitrate, glucose, cholesterol and uric acid in serum medium.

OPTIMISATION OF ENCAPSULATION AND SUSTAINED RELEASE OF QUERCETINBY CLERIGAR COATED LIPOSOMAL SYSTEM IN PH DRIVEN METHOD

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In the present work, quercetin encapsulated soy-lecithin liposomes were prepared in pH driven method using 100mM PBS (pH-7.5) buffer solution. The encapsulated liposome was further coated with a biocompatiblepolymer clerigar. Box-Behnken model was used for obtaining the best condition. The size and charge of these liposomal systems have been determined by DLS and zeta potential measurements. The morphology of these systems has been studied by TEM. The*in vitro*release assay and encapsulation efficacy has been done by UV visible spectroscopic measurements. The release of quercetin from encapsulated liposomal system was much slower compared to free quercetinin Ringer's lactate and also the clerigar coating made the release of quercetineven slower. It has been observed that both the liposomal systems followedAlfreykinetic model. Moreover, the clerigar coating also increased the encapsulation efficacy (98.75%) compared to uncoated system (82.5%) and the thermodynamic parameters have been measured from isothermal titration calorimetric measurements.

Abstract ID: 042030

GOLD NANOPARTICLE FABRICATED GRAPHENE OXIDE AS SERS PLATFORM FOR ULTRA-TRACE ANTI-BODY FREE SENSING OF CANCER BIOMARKERCEA

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A simple, fast, low-cost and efficient method is designed for the synthesis of graphene oxide (GO) (8-10 nm) from graphite using a strong oxidant Ce(IV). GO is further fabricated with gold nanoparticles (AuNPs) (5-8 nm) to generate a nanocomposite AuGO (15 nm). Raman spectral analyses confirm that synthesized AuGO has selective sensing ability for cancer biomarker, carcinoembryonic antigen (CEA) in serum. Sensing assays were also carried out in presence of high concentrations of glucose, cholesterol and insulin. Ultra-trace anti-body free sensing of CEA in serum is achieved using Surface Enhanced Raman Spectroscopy (SERS) with anLOD of 12.5 fg/mL. The interaction between CEA and AuGO were established using Raman, fluorescence, CD spectroscopy and theoretical studies. The specificity of sensing was tested with other cancer biomarkersCA 19-9, CA 125, PSAwhich did not show any signal enhancement with AuGO.

Abstract ID : 010952

SOY FLOUR – CLERIGARCOMPOSITE FLUOROGELS FOR NON-ENZYMATIC ULTRA-TRACE SENSING OF SERUM ASCORBIC ACID

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Ascorbic acid (AA) is one of the essential antioxidants in blood serum which serves as a significant indicator for oxidative stress. AA deficiency in blood serum causes scurvy and anaemia, whereas excessive AA often relates to gastric irritation. Thus, determination of AA concentration in blood serum is of utter importance. In this work abiocompatible, soy flour – clerigar based fluorescent hydrogel is developed which serves as an enzyme-free sensing platform for serum AA. The hydrogel was characterized using Fourier-transformed infrared spectroscopy and Scanning Electron Microscopy. The F_0/F vs. AA concentration plot shows a linear relationship in the range 0.10-11.0ìM with an excellent R^2 value of 0.99. The hydrogel exhibits excellent sensitivity towards AA with limit of detection as low as 0.23µM. The sensing capacity of the hydrogel was further validated in presence of various interfering biomolecules (glucose, cholesterol, bilirubin, triglyceride, phosphate, uric acid, lactic acid) commonly present in serum medium.The most interesting fact is that the sensing can be accurately done even in presence of high bilirubin concentration which is a notorious interfering agent in any kind of sensing process. The developed sensor was applied to AA detection in real human serum with satisfactory results, indicating that this sensor has enormous potential in clinical practice.

Abstract ID: 114605

CHEMOSELECTIVESYNTHESIS OF BIOACTIVEOXACYCLESVIA OXIDATIVE AND REDUCTIVE MECHANOCHEMICAL CYCLIZATION

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In the modern world, where sustainability depends on environmental protection, mechanochemistry is crucial. By applying shear forces through milling or grinding, mechanochemical techniques provided the mechanical energy to facilitate chemical reactions. This allowed the oxidation and reduction reaction to occur on the specific substrates, offering key benefits like less waste and environmental impact and a reduced need for solvents. The chemoselective synthesis of bioactive oxacycles is crucial in organic chemistry, particularly for its implications in drug development.One collective addition for a clean future is the sodium borohydride ($NaBH_4$)-promoted reductive cyclization to fused dihydrofuran under grinding process. An important achievement in organic synthesis is the creation of chemoselective reduction under silica-gel supported conditions, which provides a flexible and effective way to reduce particular functional groups inside complicated compounds. Following mechanochemical reductive cyclization, we wish to study mechanochemical oxidative cyclization where bioactive phthalide and lactone have been synthesized, in the presence of sodium chlorite and ^{t}BuOOH.

Antibacterial research on our synthesized molecules has finally created a soft bridge between biology and chemistry. By integrating these methodologies, we can streamline synthetic processes and contribute to the development of drug discovery in due time via clean pathways.

Abstract ID: 011252

ENCAPSULATION OF THYMOL IN *β*- CYCLODEXTRIN NANOCAVITIES AND ITS BINDING WITH DNA

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Cyclodextrins are oligosaccharides made of six to eight D-glucose units. β-cyclodextrins (β-CD) have various applications as drug delivery vehicles as it forms stable inclusion complexes with small molecules. Here, we report our studies on thymol because it has antimicrobial and antioxidant activities due to its phenolic structure. Here we have studied the behaviour of thymol encapsulated β-CD and its interaction with DNA and different cell lines. Various sets of this encapsulated system were prepared using Box-behnken design. Then their encapsulation efficacies were measured using several spectroscopic methods. Morphology and stability of the encapsulated systems have been characterised by using TEM and DLS respectively. UV-Visible spectroscopy indicates hyperchromic shift upon gradual addition of DNA. ITC confirms the binding interaction between β-CD-thymol and DNA. Positive "H and "S indicate hydrophobic interactions. In fluorescence, emission intensity of the complex decreases upon addition of DNA. Temperature variance and time resolved fluorescence support static quenching. Competitive displacement assay, iodide quenching and DNA melting studies suggest groove binding with DNA. By the encapsulation, thymol can be safely delivered to the living cells.

Abstract ID: 034137

SWITCHING LUMINESCENT PROPERTIES IN 1D SUPRAMOLECULAR POLYMERS OF NAPTHALIMIDE-BASED CHROMOPHORES AND DEMONSTRATION OF REVERSIBLE ANION-ASSISTED POLYMERIZATION IN MODERATELY POLAR SOLVENTS WITH CONTROLLABLE NANOSTRUCTURES AND ELECTRONIC PROPERTIES

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The dynamic and adaptive nature of supramolecular polymers has made them an intriguing class of macromolecular systems. Recent studies focus on those containing functional Π-conjugated chromophores. Solvent choice controls supramolecular interactions, affecting processeslike protein folding and Π-chromophore organization. Most H-bonded assemblies form in nonpolar solvents, where solute-solvent and solute-solute H-bonds compete, with the latter dominating in polar solvents. However, low-boiling, moderately polar solvents like THF enhance solubility and allow for uniform coating in device fabrication.

In order to do this, NMI-0, a dipolar building block based on napthalimide, was synthesized and examined. NMI-0 experienced J-type aggregation through supramolecular polymerization, creating 1D nanowires, by varying the ratio of good to bad solvent. Spectroscopic, microscopic, and rheological evidence showed efficient gel formation in nonpolar solvents. Microscopic examination and theoretical modelling verified that the solution's color shift and decreased fluorescence, which are associated with photo-induced electron transfer (PET), signalled the start of polymerization.

In tetrahydrofuran (THF), solute-solvent hydrogen bonds were broken with fluoride anions to generate highly conductive supramolecular polymers. Hydrophobic effects, Π-Π stacking, and hydrogen bonding propelled the polymerization. The structure changed from nanowires to nanosheets as the concentration of fluoride anion rose. However, the polymerization was reversed and non-luminescent spherical particles were produced when fluoride ions were trapped by adding BF_3. This revealed reversible supramolecular polymerization facilitated by anion in polar solvents such as THF. The electrical characteristics of the semiconductor based on naphthalimide can be adjusted by means of these anion-induced morphological changes.

DITOPICRECOGNITION OF RECIPROCALLY DEPENDENT CATIONS AND BIO-APT ANION BY A NEWLY SYNTHESIZED INIMITABLE ER(III)-COMPLEX

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A novel Er(III) based luminogenic coordination polymer (CP)[{$Er_2(Sal)_4(NO_3)_2$} (Salicylaldehyde)$(H_2O)_4$} has been synthesised that behave as an excellentchemosensor for the target-specific aqueous-phase detection of Cu^{2+}, $Fe^{3+}$and OH^-. Synchrotron analysis of the single crystals of the CPrevealed aone-dimensional helical chain structure in which the interstitial spaces are occupied by unreacted salicylaldehyde and water molecules which play a major role in maintaining the helix. The chromogenic response of the CPis studied in presence of several analytes (Zn^{2+}, Hg^{2+}, Cd^{2+}, Pb^{2+}, Cu^{2+}, Mn^{2+}, Fe^{3+}) in aqueous medium,which reveal that the CP specifically sensed Fe^{3+} and Cu^{2+}. The optical response of the probe with Fe^{3+} andCu^{2+} was validated by UV-Vis spectroscopy. The effective interaction of the targeted analyte (Fe^{3+} andCu^{2+}) with the sensor moiety was confirmed by the calculation of the binding constant values.The fluorogenic responses of the CP with OH^- ions were also investigatedby photoluminescence spectroscopy. The emission peak of the free sensor CP was found to enhance 3-fold in intensity upon gradual addition of OH^-, owing to ICT-based fluorescence enhancement.More interestingly, the CP was used in determining the concentration of Fe^{3+} in different parts of banana plants as a dietary measure for anemic patients and as a user affable tool for Cu^{2+} detection from swimming pool to avoid copper mediated skin disease. Notably, in the context of the above studies, this is the first-time report of any Er-based CP to be examined in the real-world applications.

Abstract ID : 050757

ENHANCED FLUORESCENCE AND HYPERTHERMIA THERAPY BY POLYDOPAMINE ENGINEERED COBALT FERRITE NANOPARTICLES

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Simultaneously probing and treating cancer cells remains a significant challenge in cancer therapy. This study explores the potential of using polydopamine (PDOPA) in combination with cobalt ferrite nanoparticles (CF NPs) to enhance the efficacy of hyperthermia treatment for cancer. Polydopamine offers two advantages: it is highly fluorescent, aiding in cellular imaging, and it induces cytotoxicity, helping to kill cancer cells. On the other hand, cobalt ferrite nanoparticles generate heat when exposed to an alternating current (AC) magnetic field, making them suitable for hyperthermia therapy.

We synthesized a conjugate material by functionalizing cobalt ferrite nanoparticles with polydopamine (CF-PDOPA-NPs) and tested their dual functionality. These CF-PDOPA-NPs were tagged to cancer cells, allowing for targeted region identification through fluorescence imaging. This enabled precise application of an AC magnetic field to the tagged regions, improving the selectivity and effectiveness of hyperthermia treatment.

The study assessed the performance of CF-PDOPA-NPs compared to free cobalt ferrite nanoparticles (CF NPs) in hyperthermia therapy. Human mammary carcinoma cells (MDAMB-231) were treated with both CF and CF-PDOPA nanoparticles, and results showed enhanced cytotoxicity and improved imaging with the conjugate material. The findings suggest that CF-PDOPA-NPs offer a promising approach for combining imaging and treatment in cancer therapy, outperforming free CF NPs in both aspects.

Abstract ID: 103554

POLYURETHANE BASED CROSSLINKED NANOASSEMBLIES : AROUT TO COCKTAIL DRUG DELIVERY FOR CANCER THERAPY

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Supramolecular nanoassemblies based on polymers are of great interest for anticancer treatment because they can stably encapsulate drug molecules and release them in response to specific stimuli. In the realm of drug delivery, core-crosslinked micelles have garnered significant attention due to their superior colloidal stability, biocompatibility, efficient drug loading, stimulus control, and prolonged release compared to other nanoassemblies. Here, we have designed and synthesized an amphiphilic polyurethane with a GSH-responsive disulfide bond, which was then cross-linked using reducing agent, dithiothreitol (DTT) in a straightforward thiol-disulfide exchange reaction. The kinetics were tracked by measuring the intensity of absorption of release pyridine-2-thiol during cross-linking, and the reaction conditions were mild and did not require any organic solvents or metal-containing catalysts. Here the degree of crosslinking would regulate the drug release kinetics. The FT-IR, GPC, and ^{1}H NMR investigations were used to characterize the polymer structure. The *in vitro* dual release of anti-cancer drug, doxorubicin (DOX) and camptothecin (CPT) from the micelles was observed when nanoasseblies were treated with reducing agent, glutathione (GSH) at a cytosolic concentration (10 mM). FRET experimenthave demonstrated the stability of the guest encapsulation within the nanoaggregate and the tunability of guest molecule release. To illustrate how a dual drug delivery system increases the efficiency compared to the single drug delivery, a cancer cell line was used and on the other hand, as a control, a normal cell line was used.We believe the cocktail drug deliverywould offer a viable and effective approach to cancer treatment.

Abstract ID: 104710

A PHOTOPHYSICAL EXPLORATION OF COMPARATIVE BINDING INTERACTION OF A MOLECULAR ROTOR THIOFLAVIN T WITH POLYMORPHIC FORMS OF RNA: A DEMONSTRATION OF NUCLEIC ACID-MEDIATED ENERGY TRANSFER TRIGGERED WHITE LIGHT GENERATION

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Photophysical studies on the interaction of small molecules with nucleic acids drags severe attraction nowadays to delineate molecular level mechanism of various biological processes occurring *in vivo*. Herein, we employed vivid steady state and time resolved spectroscopic techniques to elucidate the comparative binding interaction of a biologically active cationic dye Thioflavin T (ThT) with double and triple helical RNA structures, namely, A.U duplex and U.A*U triplex respectively. In both the cases, binding was associated with regaining of fluorescence intensity of ThT which was intrinsically lost due to nonfluorescent TICT process accompanied by tortional rotation around C-C single bond. Binding constant was found to be greater for U.A*U triplex (K_bS $10^5 M^{-1}$) than A.U duplex (K_bS 10^4 M^{-1}) at 293.15K. However, steady state absorption study, steady state and time resolved spectrofluorimetric and anisotropic studies, anionic quenching study, CD study unveiled that the binding mode was partial intercalation in both the cases and the extent of intercalation was stronger in A.U duplex. Apparent anomaly in binding affinity and intercalation strength probably lies in the interplay of two factors-nonplanner structure of ThT and columbic relaxation on binding. Fluorescence contact energy transfer study revealed a substantial energy is transferred from RNA bases to the ThT in bound form. We also observed that the systematic addition of orange emitting ethidium bromide to cyan emitting ThT-RNA complex led to white light generation through FRETmechanism.This work renders the utility of ThT as a potential prerequisite for its application in pharmacological and optoelectronics industry.

Abstract ID: 105924

TRANSITION METAL FREE, EASY AND CONVENIENT METHOD FOR SYNTHESIS OF INDENOFURANSAND INDENOBENZOFURANS

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Indenone core structure is omnipresent in various important natural products and pharmaceuticals. Natural products such as onychnine, euplectin, neo-lignin, and indotecan (LMP400) contain the indanone core moiety. The synthetic molecules endowed with an indenone framework have a wide range of biological activities such as anti-HIV, cytotoxicity, phosphodiesterase inhibition, antiinflammatory, and adenosine A2A receptor antagonists. Besides, indenone fused heterocyclic substructures are attractive pharmacomodulations where O-containing heterocycles such as furans andbenzofurans play an important role in the architecture of polycyclic heterocyclic frames, such as the tricyclic indenofurans, which are key substructures for natural product solanacol,ramelteon, and (-)-galiellalactone. Specifically, tetracyclic indenobenzofurans received considerable attention from a synthetic and biological standpoint due to their outstanding pharmacological properties. Due to their importance, a considerable number of synthetic models have been developed for the synthesis of indenone derivatives. We have developed transition metal free, simple two-steps synthetic strategy for the synthesis of Indenofurans and Indenobenzofurans. Our method is highly efficient, cost-effective, high yielding compared to the all the available method in the literature.

EXPLORING THE CR(III) SENSING AND PROTEIN-BINDING BEHAVIOR OF A TRIAZOLE BASED COMPOUND : A FLUORESCENCE SPECTROSCOPIC STUDY

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Detection of Cr(III) is important in the field of biology, nutrition and environmental monitoring. For detection of Cr(III) several fluorescent chemosensors have been designed. However there are very few 1,2,3 triazole based Cr(III) chemosensors. Triazoles are also an important structural fragment used in the field of drug development and research. Keeping these ideas in mind, a novel 1,2,3 triazole based organic molecule (SRP-AP-2) has been synthesized and its application in the field of Chromium sensing and drug design is investigated at the primary level. The synthesized compound is fluorescent in nature and is able to detect Cr(III) ion by fluorescence turn-off process which is visible under naked eye at the wavelength of 340 nm. Job's plot predicts a 1:1 stoichiometry of the complex formed during the reaction occurring between SRP-AP-2 and Cr(III). The limit of detection value (LOD) of SRP-AP-2 for Cr(III) sensing is found to be 18.01 micromolar concentration. Additionally, the interaction of SRP-AP-2 is investigated with two biomolecules, Human Serum Albumin (HSA) which is a model transport protein and Bromelain (BMLN) which is a proteolytic enzyme. SRP-AP-2 shows good binding interaction with both HSA and BMLN (binding constant in the order of 104-105) at pH 7 and different temperatures (288K, 298K, 308K). The sensing experiments indicate SRP-AP-2 can be useful as an Cr(III) sensor. The binding study of SRP-AP-2 with HSA indicates its primary drug-ability and the binding study with BMLN indicates that BMLN can be considered useful to improve its drug-likeness property, subject to further studies.

DEVELOPMENT OF PB(II)TPP-PANI-CNT COMPOSITES WITH ENHANCED DIELECTRIC PROPERTIES

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In this report we present the synthesesof composite materials combining Pb(II)-*meso*-tetraphenylporphyrin [Pb(II)TPP] with polyaniline-carbon nanotube (PANI-CNT) conjugates, aiming to develop materials with enhanced dielectric constants. Dielectric measurements conducted at room temperature over a range of frequencies revealed that pure Pb(II)TPP exhibits a dielectric constant of 7.81. In contrast, composites containing 25% and 50% PANI-CNT showed significantly increased dielectric constants. This enhancement is likely due to ð-ð stacking interactions between the aromatic rings in Pb(II)TPP and PANI, which form stable charge-holding clusters. These clusters promote localized charge storage, resulting in improved dielectric properties. Although, Pb(II)TPP alone showed negligible solid-state conductivity due to limited intermolecular interactions, the composite materials' high dielectric constants make them promising candidates for energy storage applications, including supercapacitors. Future research will focus on fine-tuning PANI-CNT concentrations and investigating the composites' thermal and electrochemical stability to support their integration into advanced energy storage devices.

Abstract ID: 123637

AGGREGATION AND INTERFACIAL BEHAVIOR OF AQUEOUS 1-DECYL-3-METHYLIMIDAZOLIUM CHLORIDE IN PRESENCE OF SODIUM POLYACRYLATE

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The interactions between a cationic surface active ionic liquid, 1-decyl-3-methylimidazolium chloride (DMImCl), and an anionic polyelectrolyte sodium polyacrylate (NaPAA) at the air/solution interface as well as in the bulk solution have been investigated. Tensiometry, conductometry, and vapor pressure osmometry in conjunction with the density functional theory (DFT) approach have been used in this study. Tensiometric data have been interpreted qualitatively in terms of the formation of three species consisting of the surfactant (S) and the polyion (P) in the system namelya surface-active complex (PS_s), a bilayer complex (P_S^b) which can only adsorb on the pre-formed complex PS_s, and a non-surface active polyion-micellar aggregate (PS_M) along with the micellar aggregates of the surfactant molecules. Compared to the polyelectrolyte-free case, micellization of DMImCl has been found to become thermodynamically less spontaneous when NaPAA is added. The results reveal that the micellization is exothermic and that it is driven by entropy. Interfacial adsorption has been found to deteriorate as the temperature is elevated. The DMImCl micelles in presence of NaPAA has been predicted to assume spherical geometry irrespective of the experimental temperature or the amount of the polyelectrolyte added. The influence of polyion charge density on the interfacial and aggregation behavior of aqueous DMImCl solutions has been discussed to elucidate nature of subtle interactions prevailing in these complex fluids.

Abstract ID: 041120

PARTICLE-WALL ALIGNMENT INTERACTION AND DIRECTED AUTONOMOUS MOTION OF JANUS PARTICLES

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Active matter refers to systems that can extract energy from their environment and convert it into work. The living systems serve as prime examples of such systems, however, a notable research development is found for their artificial counterpart (e.g., Janus particles).The study of both living and artificial self-propelled particles has garnered significant interdisciplinary interest due to their appealing application potential. We numerically show that due to particle-wall alignment interaction, active Janus particles exhibit directional motion without any external drive or biasing force when they are placed in a smooth 2D narrow channel. To examine the details of how particle-wall interactions influence the rectification we consider all possible stable configurations of the particles near the boundary. However, we focus on the three stable configurations which are more likely to occur in practice. They are; configuration I, where the self-propulsion velocity is perpendicular to the channel wall; configuration II, where the self-propulsion velocity forms an acute angle with the wall; and configuration III, where the self-propulsion velocity is parallel to the walls. To generalize our findings, we consider both chiral and achiral active particles in our studywhich witness a broader range of behaviours.

Abstract ID: 052727

EXPLORING THE PROSPECTS OF POTASSIUM VANADATE AS NEGATIVE ELECTRODE IN AQUEOUS AL-ION BATTERY FOR SOLAR APPLICATIONS

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Aqueous Al-ion batteries (AIBs) are underexplored for large-scale solar energy storage, but have good promise due to low cost and excellent safety profile. Herein, we develop a low-cost AIB using potassium vanadate ($K_{0.51}V_2O_5$/KVO) as the negative electrode, and copper-Prussian blue analogue ($Na_2CuFe(CN)_6$/Cu-PBA) as the positive electrode in 0.5 M$Al_2(SO_4)_3$ electrolyte. In this study a corrosion inhibited SWCNT coated SS304 current collector is used. All the materials are physicochemically and electrochemically tested. With its stable layered structure and multiple valence states, KVO shows great promise as a negative electrode material.The KVO electrode delivers a specific capacity of ~49 mAh g{ ^{1} at 100 mA g{ ^{1}, with good rate capability. A 1.5 V Cu-PBA//KVO full cell is assembled using SiO_2-$Al_2(SO_4)_3$ hydrogel electrolyte. Finally, a 4 V/5 mAh prototype AIB is fabricated and tested for feasibility under solar charging and constant load discharging conditions.

Abstract ID: 053842

AN ALL POLYMER FLEXIBLE ASYMMETRIC SUPERCAPACITOR WITH POLYANTHRAQUINONESULFIDE NEGATIVE AND POLY-SCHIFF BASE POSITIVE ELECTRODES IN SIO_2-$AL_2(SO_4)_3$ HYDROGEL ELECTROLYTE

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Flexible supercapacitors have garnered significant attention as promising energy storage solutions for wearable and portable electronics due to their impressive characteristics, including high capacitance, rapid charge/discharge capabilities, and exceptional flexibility. In this work, we have developed flexible asymmetric supercapacitor with polyan thraquinone sulfide (PAQS) as negative and Schiff base polymer as positive electrodes in0.5M $Al_2(SO_4)_3$electrolyte. Electrochemical characterizations are carried out through cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS) and galvanostatic charge discharge (GCD) measurements. The PAQS-based negative electrode demonstrates an impressive specific capacitance of 700 mF g^{-1}, while the Schiff base polymer based positive electrode deliversa higher specific capacitance of around 1100 mF g^{-1} at a current density of 10 mA g^{-1}. An asymmetric supercapacitor full cell is assembled with all polymer components including SiO_2-$Al_2(SO_4)_3$ polymeric hydrogel electrolyte. Additionally, we have developed a flexible prototype device and successfully tested its real-life feasibility.

Abstract ID: 083445

SILICA SUPPORTED NICKEL CATALYSIS FOR CARBONYLATIVE SYNTHESIS OF FUNCTIONALIZED ARYL IODIDES

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Nickel the “spirited horse” of transition metal catalysis has emerged to have possessed remarkable synthetic applications due to having contrasting features. It has delicate and uncontrollable nature in spite of having some advantages i.e. a) accessibility of different oxidation states, b) capability of carrying out various transformations from usually unreactive substrates etc. However, synthesis of functionalized iodides proceeding via activation of ethers has been a challenging task.Generally, nickel as metal is seldom studied in carbonylation due to the formation of toxic $Ni(CO)_4$. To develop carbon monoxide free carbonylation reaction technique, different CO surrogates can be used. In this perspective, we have synthesized silica nanoparticles to use it for the grafting of the nickel catalysts and $Mo(CO)_6$ has been used as carbon monoxide source. Some features of the catalysis are: non-noble metal catalysis, ether acting as a nucleophile, selective functionalization of aryl iodides etc.The transformations have been found to be highly selective towards iodides with moderate to good yields.To counter this, we have developed a catalytic model using nickel as the active metal centre, synthesized a series of nickel catalysts using pyridine, thiophene and imidazole moiety-based Schiff-base ligands and immobilized them onto silica nanoparticles which is capable of carbonylative synthesis of functionalized aryl iodides along with high selectivity.

Abstract ID: 090850

β–SELECTIVE ADDITION OF ?-BUTENOLIDES TO 1,3-DIPOLES UNDER LEWIS ACID ACTIVATION

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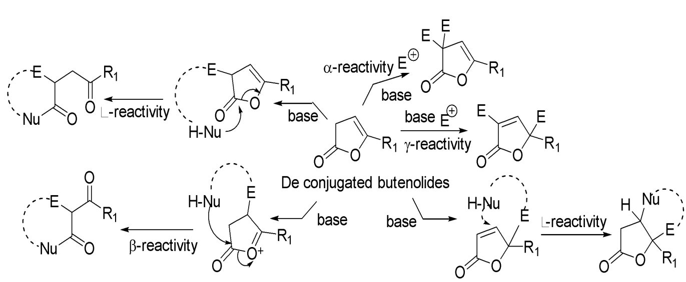
Butenolide are class of cyclic esters that occur various natural products and bioloactive compounds. The biological activity often correlates with their enantiopurity. Therefore catalytic asymmetric transformation involving -butenolides is attractive among chemists to build complex molecular scaffolds with pharmaceutical relevance. β, γ – unsaturated γ-butenolides are most striking due to their ready accessibility, high reactivity and well-studied chemistry for the direct β–functionalization through Michael/ aldol reaction, isomerization and cascade reactions under metal catalyzed/organocatalytic conditions. Addition of such systemto various reactive electrophiles e.g. nitroolefins, aldimines,vinyl sulfones etc. has already been reported.In most of the cases, γ-selectivity$^{\beta}$ is observed over α-addition. Herein, we present βselective addition of deconjugated butenolide to various 1,3-dipolar scaffolds under Lewis acid activation.

Scheme 1: Reactivity of deconjugated butenolide.



STATISTICS, MATHEMATICAL SCIENCES, IT AND ITS APPLICATIONS

Abstract ID: 050009

β-SEMIOPEN SET AND ITS APPLICATIONS IN FUZZY M–SPACE

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Fuzzy minimal structure is introduced by Alimohammady and Roohi as follows : A family M of fuzzy sets in a non-empty set X is said to be a fuzzy minimal structure on X if $\alpha 1_X \in$ M for every $\alpha \in [0, 1]$ [1]. However a more general version of it (in the sense of Chang) is introduced in [4, 5] as follows : A family F of fuzzy sets in a non-empty set X is a fuzzy minimal structure on X if $0_X \in$ F and $1_X \in$ F. In this paper, we use the notion of fuzzy minimal structure in the sense of Chang. In [2], we introduced fuzzy minimal space (fuzzy m-space, for short) as follows : Let X be a non-empty set and m CI^X. Then (X, m) is called fuzzy m-space if $0_X \in m$ and $1_X \in m$. The members of m are called fuzzy m-open sets and the complement of a fuzzy m-open set is called fuzzy m-closed set [2].

In this paper a new type of fuzzy set in fuzzy minimal space, viz., fuzzy m-β-semiopen set is introduced and characterized in several ways. Afterwards, three different types of functions, viz., fuzzy (m, m_1)-β-semicontinuous, fuzzy almost (m, m_1)-β-semicontinuous and fuzzy (m, m_1)-(β-semi, r)-continuous functions are introduced and studied. Lastly, some applications of these three functions are established here.

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Abstract ID: 091034

COMMON FIXED POINT THEOREM FOR FUZZY MAPPINGS IN BANACH SPACES

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The primary objective of this paper is to present a common fixed point theorem for fuzzy mappings within the framework of a complete normed linear space i.e. a Banach space. The findings extend and broaden several existing results from the current body of literature on this topic. To further substantiate the validity of the proposed theorem, a detailed example is included, demonstrating its applicability and correctness.

Abstract ID: 091225

ON LEAVITT PATH ALGEBRAS OF DIRECTED POWER GRAPHS

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In this paper, we characterize several graph-theoretic properties of directed power graphs associated with finite semigroups and various algebraic structures of their Leavitt path algebras. Consequently, we provide stronger version of the Cuntz-Krieger uniqueness theorem for Leavitt path algebra of directed power graph. Finally, we investigate stable rank of Leavitt path algebra of directed power graph associated with a finite group.

Abstract ID: 124245

SMART VOICE CONTROLLED HOME ASSISTANT USING IOT

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This low cost Smart Voice Controlled Home Assistant aims to deliver a comprehensive home automation solution that includes controlling light & Fans, managing date time, providing real-time weather updates, setting alarms, and playing music through YouTube and natural voice commands. The main features are a) Voice Command Recognition Information and retrieval of information from the Web (Wiki info (using wiki API) & web access) b) Device Control Integration (e.g., lights) c) Utility service of devices (Alarm and Clock Setting etc.). The Smart Voice Controlled Home Assistant works by following several steps of 1. Voice Command Capture 2. Command Interpretation using natural language processing (NLP) 3. Intent Mapping. For example, commands- "Turn on Fan with High speed." 4. Device Control 5. Response to user accordingly. To implement it the hardware device requirements are Arduino UNO, Arduino Board, Relay Module, Motor Driver, LED Bulb, Fan and Breadboard. And software components are python modules (pyttsx3, speech _recognition, datetime, pytz, serial, time, requests, wikipedia, webbrowser, transformers, and os modules). Moreover, integration of BOT and device control is very rear (or with less featured) after various literature survey from internet.

It can manage and control various devices which enhances convenience, efficiency, and accessibility within the home environment, providing users with a seamless and user-friendly interface for managing everyday activities. Here,some potential future scope areas are personalization (to learn user preferences and patterns to control devices), security, integration and Multi-Language recognition which will be included further.

Fig1. Controlling Light

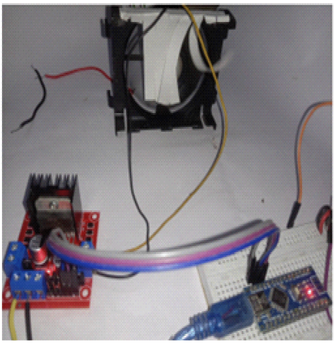

Fig2. Controlling Fan (Low/Mid/Fast speed)

A COMPUTATIONAL PIPELINE FOR CANCER BIOMARKER IDENTIFICATION BASED ON ADAPTIVE β-HILL CLIMBING-AIDED METAHEURISTIC OPTIMIZATION

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Detection of cancer biomarker is a crucial step in early diagnosis and targeted therapy. This work presents a filter-wrapper computational pipeline that leverages adaptive β-hill climbing (ABHC) aided meta-heuristic optimization algorithms for identification of biomarkers and detection of cancers from gene expression microarray datasets. The combination of ABHC with meta-heuristics enhances the search efficiency and accuracy in identifying significant gene biomarkers. In the filtering stage, combined scores of mutual information and minimum redundancy maximum relevancy are utilized to select the top p% genes from high-dimensional microarray datasets. In the wrapper stage, the candidate genes are passed to ten different ABHC-aided meta-heuristics to identify the most informative genes marking cancers using KNN classifier. Experimental findings reflect that among the ten hybrid methods, ABHC-aided whale optimization has outperformed with an average of 100% accuracy with 2.85 genes across seven datasets. Subsequent comparative analysis revealed that the obtained results have surpassed many state-of-the-art models in terms of maximum accuracy with minimum number of marker genes.

Abstract ID: 051120

PERSISTENCE OF METACOMMUNITY AND TIPPING POINT DYNAMICS IN A FEAR-INDUCED ADAPTIVE DISPERSAL STRATEGY IN ECOLOGICAL NETWORK

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The significance of dispersal in the persistence of metapopulations consisting of spatially isolated habitats of the same species, has drawn considerable attention in contemporary theoretical ecology. Dispersal is key to metapopulation persistence, increasing extinction risk through synchrony while promoting survival via spatial heterogeneity. Environmental and spatial heterogeneity profoundly impact psychological and behavior-driven interactions, influencing species dispersal rates and shaping their cooperative and competitive strategies. Fear and cost-associated cooperation are two key traits heavily influenced by environmental fluctuations and heterogeneous landscapes. Fear affected adaptive dispersal on metacommunity when prey adopts cost-associated partial cooperative strategy and their survival is still not adequately explored. This study focuses on how fear enhance the metacommunity survival on diverse dispersal topological structure. We find that fear due to predator significantly delays the community collapse. Nonetheless, costs associated cooperation among prey prior to the catastrophic transition of the metapopulations. Here, we comprehensive study this within the global, nonlocal, small-world as well as scale-free network structure. We also derive analytically the critical threshold that marks the onset of extinction across the entire network. Based on ours findings, this article explores how the fear-induced adaptive dispersal strategy delay tipping points and how the tipping points reshape under changing environmental conditions, highlighting the impact of dispersal structure on global persistence of ecological networks.

Abstract ID : 071406

EXPLORING NEIMARK-SACKER BIFURCATION AND CHAOS CONTROL IN A TRI-SPECIES DISCRETE-TIME MODEL

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This article presents a three-dimensional discrete-time ecological model to elucidate the intricate dynamics among three distinct species within an ecosystem. This approach extends traditional two-dimensional models, offering a more comprehensive perspective on ecological interactions. We identify all biologically feasible equilibria and perform a local stability analysis for each equilibrium point. Through bifurcation analysis (Neimark-Sacker and period-doubling bifurcations), we successfully demonstrate chaotic attractors via period doubling in the discrete-time model and implement chaos control through numerical simulations. By integrating this mathematical model, we derive ecological insights that contribute to informed conservation and management strategies, promoting sustainable biodiversity preservation.

Abstract ID: 085143

MATHEMATICAL INSIGHTS INTO THE INFLUENCE OF PROTEINS AND GLIAL CELLS IN ALZHEIMER'S DISEASE

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We present a mathematical model that explores the progression of Alzheimer's disease, focusing on the roles of proteins and astrocytes in the development of memory impairment. Our model is structured as a system of coupled differential equations, effectively describing the dynamics of amyloid beta (Aβ) plaques, Aβ proteins, tau proteins and astrocytes. We conduct theoretical and numerical analyses for our model. We delve into the system's dynamics by identifying biologically relevant steady states and subjecting them to local stability analysis. To gain a comprehensive understanding of the system's behavior, we examine its global stability through the construction of a suitable Lyapunov function around the interior equilibrium point.

Abstract ID: 115049

REGISTRATION BASED AUTHENTICATED ENCRYPTION SCHEME IN IOT ENVIRONMENT

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Internet of Things (IoT) has emerged as a novel paradigm for networking, effectively connecting physical and virtual entities to enhance services through both established and innovative communication technologies. In this network, each IoT device requires a unique address for individual identification, similar to how every home has a postal address. Ensuring secure communication within the IoT network, especially under adversarial conditions, necessitates an appropriate key agreement among communicating parties for encryption and identity authentication. In this study, we propose a lightweight registration-based authenticated encryption scheme tailored for the IoT environment. Registration-Based Encryption (RBE) enables users to encrypt data linked to another user's identity without relying on a trusted authority to manage encryption keys. This approach provides several advantages over conventional public key encryption (PKE), such as eliminating the need for a trusted authority, which mitigates a single point of failure and improving efficiency, as senders do not require prior access to the recipient's public key. Our scheme is based on XOR operations, secure hash functions and concatenation, leveraging the complexity of the discrete logarithm problem. Furthermore, the benefits of RBE include increased security, reduced complexity and improved scalability, making it a suitable solution for IoT applications. Additionally, our scheme is resistant to common security attacks, including impersonation, denial-of-service and replay attacks. Our approach is notably more practical for resource-constrained devices in IoT network.

Abstract ID : 070711

MENTAL HEALTH AND EDUCATIONAL OUTCOMES IN INDIA: A SOCIOECONOMIC ANALYSIS

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Nearly one in eight persons are affected by mental disorders globally with adverse consequences for education. Studies, mainly from developed countries, reveal a negative association of mental ill health and educational attainment. Literature also shows that prevalence of mental disorder is high amongst low-income groups and females. This study extends findings from developed countries to India, a fast-growing economy with high incidence of mental ill health, social stigma, low awareness, and poor infrastructure for treating mental ill-health. It examines the association between 'mental disorder' and 'mental illnesses'—treated as distinct categories—and educational attainment in India, focusing on how the intensity of these associations varies across economic quintiles and by gender. Using data from 76th round of National Sample Survey and employing ordered logit models, we find that those with mental disabilities face greatest educational disadvantages, with probability of not enrolling in formal education at 0.7132 (95% CI: 0.7066-0.7198), followed by those with mental illnesses at 0.4830 (95% CI: 0.4758-0.4903). Further, economic status significantly moderates these effects, and gender disparities persist, particularly among those with mental illnesses. It emphasizes importance of designing policies addressing mental health and socio-economic inequalities simultaneously to improve educational outcomes in low-and-middle income countries.

Abstract ID: 125447

METRIC DIMENSION OF GENERALIZED PETERSEN GRAPH P(n,3)

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Metric dimension of a connected graph was introduced by Harary *et.al.* The metric dimension of Generalized Petersen graphs were studied by many authors. Imran *et.al.* studied the Generalized Petersen graphs $P(n,3)$, where the exact value is found in case when $n \equiv 0, 1 (mod\ 6)$ and upper bounds in other cases. In this paper, we find the exact values when $n \equiv 3, 4, 5 (mod\ 6)$. This improves upon previous results where upper bounds were proved.

TOPOLOGY OF BASIN COMPONENTS IN COMPLEXIFIED DSM FAMILY

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In 2007, M. Misiurewicz and A. Rodrigues studied the following family of circle maps denoted, $f_{a,b} : T \to T$. These are called the Double Standard Maps (DSM) in [2] and they are defined as follows

$$f_{a,b}(\mathrm{x}) = 2\,\mathrm{x} + \mathrm{a} + \frac{b}{\pi}\sin(2\pi x)\,/\,1,$$

$$\text{for } \mathrm{x} \in \mathrm{T} = \mathrm{IR}/\,\mathrm{Z},\ \mathrm{a} \in \mathrm{IR}/\,\mathrm{Z},\ \mathrm{b} \in [0,1]$$

These can be seen as analytic perturbations of the doubling map. $f_{a.b}$ corresponds to the mappings $g_{a,\,b} : S^1 \to S^1$ of the complex circle (after conjugating by the exponential map) that extend to holomorphic functions (see [1]).

$$g_{a,\,b} : C^* \to C^*,$$

$$g_{a,\,b}(z) = e^{2\pi\,\mathrm{ia}}\, z^2 \exp(bz - \frac{b}{z})$$

Using an argument due to I.N. Baker, we will show that if $g_{a,b}$ has an attracting cycle of period greater than or equal to 2 then any component of the immediate basin of attraction of that attracting cycle is simply connected.

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Abstract ID: 090901

FREE WREATH PRODUCT CONSTRUCTION ARISES AS QUANTUM SYMMETRIES OF GRAPH C*-ALGEBRAS

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The quantum automorphism groups for graphs and graph C*-algebras have gained significant interest in recent years. Quantum symmetries of graph C*-algebras have been explored by several authors such as Schmidt-Weber and Joardar-Mandal, considering different categorical frameworks. It is already established that if one takes $\{\Gamma_i\}_{i=1}^n$ where all Γ_i 's are connected and isomorphic to each other, then

$$QAut_{Ban}(\sqcup_{i=1}^n \Gamma_i) \cong QAut_{Ban}(\Gamma_1) \wr_* S_n^+ \quad \text{and}$$

$$QAut_{Bic}(\sqcup_{i=1}^n \Gamma_i) \cong QAut_{Bic}(\Gamma_1) \wr_* S_n^+$$

where $QAut_{Ban}(\Gamma)$ and $QAut_{Bic}(\Gamma)$ denote the quantum automorphism groups of Γ in the sense of Banica and Bichon, respectively. Now, a related question also arises in the context of graph C*-algebra: what is the relationship between $QAut_{JM}(\sqcup_{i=1}^n \Gamma_i)$ and $\{QAut_{JM}(\Gamma_i)\}_{i=1}^n$? Here, $QAut_{JM}(\Gamma)$ denotes the quantum automorphism group of graph C*-algebra $C^*(\Gamma)$ in the sense of Joardar-Mandal. Specifically, does it hold

$$QAut_{JM}(\sqcup_{i=1}^n \Gamma_i) \cong QAut_{JM}(\Gamma_1) \wr_* S_n^+$$

if all Γ_i 's are isomorphic? In this scenario, the answer is negative. We have encountered a graph, denoted as P_1 (a simple directed path of length 1), with two copies in which the isomorphism mentioned above does not hold. More precisely, $QAut_{JM}(P_1 \sqcup P_1)$ is not the same as $QAut_{JM}(P_1) \wr_* S_2^+ \cong C(S^1) \wr_* S_2^+$. Furthermore, we have identified a class of graph C*-algebras, namely the Cuntz algebras with n generators O_n (whose underlying graph is L_n) for which $QAut_{JM}(\sqcup_{i=1}^m L_n) \cong QAut_{JM}(L_n) \wr_* S_m^+ \cong U_n^+ \wr_* S_m^+$.

ON THE NUMBER OF ISOMORPHISM CLASSES OF D-INTEGRAL CIRCULANT GRAPHS

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The algebraic degree Deg(G) of a graph G is the dimension of the splitting field of the adjacency polynomial of G over the field Q. It can be shown that for every positive integer d, there exists a circulant graph with algebraic degree d. Let C(d) be the least positive integer such that there exists a circulant graph of order C(d) having algebraic degree d. A graph G is called d-integral if Deg(G)=d. We call a d-integral circulant graph minimal if order of that graph equals C(d). Let $F_{n,d}$ denote the collection of isomorphism classes of connected, d-integral circulant graphs of some given possible order n. In this paper we compute the exact value of C(d) and provide some bounds on $|F_{n,d}|$, thereby showing that the minimal d-integral circulant graph is not unique. Moreover, we find the exact value of $|F_{p,d}|$ where both p and d are prime.

PRICE AND SERVICE DECISIONS IN A SUPPLY CHAIN WITH COORDINATION CONTRACTS

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Nowadays, products are sold across various retail channels, with each retailer working to attract customers to their channel by providing superior service compared to competitors. To differentiate from competitors, some retailers provide additional perks such as free extra services, complimentary roadside assistance, extended warranties, and added accessories. In our model, a single manufacturer distributes the product through multiple retailers. Each retailer's demand is influenced by both its retail price and service level. We begin by developing the decentralized model, followed by an analysis of the centralized model. To enhance supply chain efficiency, coordination among supply chain members is crucial. We therefore implement contracts such as service cost-sharing contracts and retail fixed markup (RFM) contracts to improve overall supply chain performance. We apply a Stackelberg leader-follower game approach to solve the model, with the manufacturer acting as the Stackelberg leader and the retailers as the followers. The numerical analysis reveals that, as expected, the centralized system yields the highest profit. The contracts partially coordinate the decentralized system, creating mutually beneficial outcomes for all supply chain participants. Among these strategies, the RFM strategy provides the most favorable outcomes for all parties involved. We also calculate the exact percentage of service costs that the manufacturer must share to ensure a mutually beneficial outcome for both the retailer and the manufacturer under the service cost-sharing contract.

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Abstract ID : 064428

DEMATEL METHOD WITH FINITE INTERVAL TYPE-2 GAUSSIAN PYTHAGOREAN FUZZY NUMBER FOR DIAGNOSIS OF DIABETES

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Fuzzy Multi-Criteria Decision-Making (MCDM) paradigms have long been venerated as the most apropos frameworks for navigating the labyrinthine nature of decision-making under uncertainty, yet the rudimentary limitations of type 1 fuzzy sets are readily apparent, particularly in their inability to encapsulate higher-order uncertainties. While numerous scholarly endeavors have ventured to augment fuzzy theory by embedding Gaussian membership functions within type 2 fuzzy systems, these contributions remain deficient in addressing the concept of falsity, an equally pivotal component of uncertainty modeling. In this discourse, we introduce a novel construct: the finite interval type 2 Gaussian Pythagorean fuzzy number (FIT2GPFN), which elegantly incorporates falsity alongside truth within the type 2 Gaussian fuzzy domain. This framework is fortified by the formulation of arithmetic operators specifically designed for FIT2GPFNs, accompanied by the derivation of a signed distance function predicated upon value and ambiguity for the express purpose of defuzzification. Leveraging this advancement, an extended DEMATEL methodology is deployed, seamlessly integrating FIT2GPFNs into the diagnostic criteria for diabetes, elucidated through a cause-effect diagram that reveals the latent interdependencies. The quintessential feature of this model, namely its capacity to concurrently account for both truth and falsity uncertainties while maintaining the inherent symmetry of the Gaussian function—so germane to real-world complexities—promises profound implications for the early diagnosis of diabetes, augmenting both precision and clinical efficacy.

Abstract ID: 104022

EVOLUTIONARY GAME THEORETIC ANALYSIS OF SMART SUSTAINABLE SUPPLY CHAINS: FROM INFANCY TO MATURITY

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Over the past two decades, widespread environmental degradation has led consumers, enterprises, and governments to prioritize sustainability in industries as well as supply chains. Despite the importance of technology in advancing sustainable supply chains (SSC), its efficiency falls short due to the complex, dynamic interactions among stakeholders. This study aims to analyze the government policies and internal entities' sensitivities to build a steady robust SSC in a dynamic environment. Illuminating the intricate dynamics, this study presents a quadrilateral evolutionary game model that encompasses traceability and sustainability-sensitive governments, manufacturers, third-party collectors, and consumers within SSCs. Blockchain technology (BT) presumes to ensure product traceability, while qualified recycling practices integrated with sustainable manufacturing processes uphold sustainability in SSCs. Solving replicator dynamics, we identify the equilibriums and their stability. Our numerical simulations reveal that the strategies of each entity are significantly influenced by the decisions and policies of others. We find that both traceability and sustainability sensitivities significantly impact the evolutionary trajectory and stable strategies of SSCs. Importantly, as SSCs evolve, these sensitivities can substitute for policy factors, highlighting the need for regulatory frameworks to align with the evolving SSC landscape. Our study offers a comprehensive framework for understanding the evolutions of SSCs, emphasizing the critical role of technology and stakeholder sensitivities—both independently and in conjunction with regulatory measures— in shaping sustainable practices across development stages.

Abstract ID: 105812

ON A GRAPH OVER $C^*(X)$

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In pursuit of the objective of studying rings of bounded continuous functions $C^*(X)$ over a Tychonoff space X in a graphical context, we define a suitable graph over $C^*(X)$. We briefly study a few aspects like connectedness, diameter, radius, cycles, chords, dominating sets etc. of this graph. We also inspect the cliques of the graph and finally provide an algebraic expression for every maximal clique. Also, we prove that the graph contains at least 2^c many different maximal cliques which can never be mapped from one to another under an isomorphism. Moreover, we inquire about the neighborhood of any vertex of the graph in a topological sense. We then observe the correspondence between graph isomorphisms on the graph, ring isomorphisms on $C^*(X)$ and homeomorphisms on X when the topology of X is suitably chosen.

ENVIRONMENTAL SCIENCES
INCLUDING CLIMATE CHANGE

Abstract ID: 105414

AI APPLICATIONS IN THE SUNDARBANS : A PROPOSED FRAMEWORK

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The Sundarbans, a UNESCO World Heritage Site, faces significant climate-related challenges, including rising sea-levels, increased salinity, and more frequent extreme weather events, impacting both its ecosystem and local communities. This study investigates the anthropogenic effects on climate systems in West Bengal, India, by analyzing historical climate data, socio-economic factors, and land-use patterns to quantify human-induced climate change and its ramifications. Key findings reveal temperature rise, rainfall variability, sea-level rise, and land-use changes.

The study proposes a framework for integrating artificial intelligence (AI) to tackle these challenges through various applications. Predictive modeling can forecast sea-level rise, storm surges, and salinity intrusion. Remote sensing and monitoring using satellite imagery and drone surveillance can track environmental changes. AI can enhance climate change adaptation strategies, including species conservation, agricultural adaptation, and coastal protection. Community resilience can be bolstered through early warning systems, optimized disaster response, and economic diversification.

Effective implementation requires a robust governance framework, emphasizing centralized coordination, intergovernmental cooperation, community engagement, and ethical considerations. By harnessing AI technology, the Sundarbans can serve as a model for climate change adaptation and sustainable development, safeguarding its unique ecosystem and the livelihoods of its inhabitants.

Abstract ID : 033022

B.Ed. TRAINEE STUDENTS' CLIMATE CHANGE AWARENESS TOWARD SUSTAINABLE DEVELOPMENT GOALS- A STEP FOR MISSION LIFE

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This paper aims to assess the B.Ed. Trainee students' Environmental awareness toward SDGs. 113 B.Ed trainee students were taken randomly from three different universities situated in Kolkata, West Bengal. A questionnaire namely "Student's Climate Change Awareness (cca) toward SDG" developed by Mayflor G. Agustin (2022) was used as the tools. FGD done for qualitative analysis of the results. Both qualitative and quantitative analysis was done. The findings showed that the B.Ed. Trainee students' awareness about climate change towards SDG is high. There exists no significant difference in the perceptions of trainee students with respect to gender and their locality of residence. 83.8% students agreed to plant trees to help our environment, 85.2% students agreed to the statement that water level will rise if all the glaciers will melt. 88.8% believe that nothing is permanent in this world except change. 85.2% disagreed spread fake news to the locality regarding the disaster. In the focus group discussion, students showed their keen interest to convey the message of 17 SDG to the students in the classroom at the time of school internship program. They agreed with 'Mission Life' to preserve water, to manage waste including e waste, to conserve energy towards sustainability following 7 principles namely rethink, refuse, reduce, reuse, repair, recycle, recover in daily life. The study is important since attitudes, beliefs and feelings to their duties and issues related to environment can be best solved by the young generation of the students.

Abstract ID : 085551

THE FUTURE OF ORGANIC FARMING IN WEST BENGAL : A CASE STUDY ON VERMICOMPOSTING

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Sustainable agriculture aims to prevent environmental pollution, maintain soil health, and reduce chemical fertilizer use. Organic matter in the soil improves its physical, chemical, and biological qualities, enhancing water retention and cation exchange. Vermicomposting uses earthworms and microorganisms to transform organic waste into nutrient-rich vermicompost. The process is used at the self-sustainable dairy farm at Ramakrishna Mission Residential College in Kolkata. The farm features efficient vermicomposting systems for managing cow dung sustainably and a biogas plant that can handle 1000 kg of waste per day, generating cooking gas. The soil sample from the same area is slightly alkaline and productive (measured NPK values) for agricultural activities. The West Bengal government launched the Organic Haat in Newtown, Kolkata, another study area for research, as the state's first organic market. The market offers a variety of organic daily essentials and supports rural livelihoods through collaborations with NGOs. According to the survey, the market for organic products, specifically Organic Haat, is poised to be the most profitable in the future due to its focus on bringing natural products into urban areas. Authorities have already taken steps to support this market by organizing conferences, meetings, and awareness programs, and by announcing subsidies to encourage the growth of environmentally friendly farming practices and their yields.

ASSESSING THE ENVIRONMENTAL AND CLIMATIC CONSEQUENCES OF BRICK KILNS IN DINGA KHOLA, HOWRAH

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The proliferation of brick kilns in Dinga Khola, Howrah, has resulted in significant environmental degradation and contributes to global climate change. These kilns release substantial amounts of air pollutants such as particulate matter, carbon dioxide, and sulfur compounds which accelerate climate change, global warming, and sea level rise. Additionally, the kilns produce toxic ash, which degrades local ecosystems by contaminating soil and water sources. The extraction of raw materials, particularly clay from riverbeds, accelerates riverbank erosion and heightens the risk of disasters such as floods. This study aims to assess the environmental impact of brick kiln emissions on air quality, climate patterns, and local biodiversity, alongside examining the consequences of unsustainable raw material sourcing from riverbeds. Through data collected from field observations, pollutant measurement, and interviews with local stakeholders, this research highlights the urgent need for mitigation measures, including the introduction of cleaner production technologies and stricter regulations on raw material extraction. The findings underscore the role of brick production in intensifying climate change and propose strategies for reducing its environmental footprint, thereby supporting sustainable development for both local ecosystems and the global climate.

Abstract ID: 092319

IMPACTS OF CLIMATE CHANGE ON NON-COMMUNICABLE DISEASES: THROUGH A LENS OF GENDER

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Background

Nowadays, climate change and human health are considered as global crisis by different stake holders of society responsible for holistic development across the world. Non-communicable diseases (NCDs) are an immense threat in the wake of climate change while women and men experience climate change differently.

Objectives:

The study aims to explore potential global climate change impacts on NCDs and that too through the gender lens.

Material and Methods:

The study is based on secondary data. The data on NCDs has been collected from World Bank Data and WHO. Climatic data is also derived from World Bank Data. A One-Way Repeated Measures ANOVA, multiple regression and Paired Sample T-Test were executed for analyzing the data.

Results

One-way repeated measures ANOVA test results revealed that there was a significant effect on the surface temperature change as well as multi-hazards occurrences for time. This means that with the span of time climatic variables and extreme events are growing day by day. Multiple regression results explored that climate change variables are the significant determining factor for different NCDs. Paired-samples t-test result reveals that female's susceptibility to overall NCDs are higher compared to male population in the world.

Conclusions

Gender equality is a component of the sustainable development goals (SDGs) as well as precondition for achieving sustainability. So, it is the crucial need to acknowledge the gender dimension of climate change impacts on human health, and for that to be reflected in the policy frameworks.

RAPID COMPOSTING OF KITCHEN WASTE BY BIOAUGMENTATION WITH AN INTRA-SPECIES *PSEUDOMONAS* CONSORTIUM

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Municipal and kitchen waste significantly contribute to landfill overflow, greenhouse gas emissions, and pollution. Composting provides a sustainable alternative by converting organic waste into nutrient-rich compost, which can be improved through bioaugmentation. This technique introduces beneficial microorganisms, like *Pseudomonas* species, known for their metabolic versatility, to enhance decomposition, nutrient cycling, and pathogen suppression, boosting compost quality. In our study, various Pseudomonas strains were evaluated for cellulase, pectinase, protease, and lipase production. Four of the most active *Pseudomonas aeruginosa* strains were combined into a microbial consortium. This consortium was tested for composting mixed kitchen waste, while cellulolytic and pectinolytic strains were used to assess plant-based waste compostability, with parameters monitored every three days. The C/N ratio of the bioaugmented mixed waste compost dropped below 12 (indicating maturity) in 18 days, while it took 27 days for the bioaugmented plant-based waste. Uninoculated controls reached maturity in 36 and 45 days, respectively. Stability parameters like nitrifying activity and microbial respiration showed similar trends. The pH and EC of the bioaugmented mixed waste stabilized at 7.2 and 3.4 mS/m by day 18, and the germination index exceeded 80 in 15 days, indicating rapid maturity compared to other systems. The time-dependent analysis revealed that *Pseudomonas* consortia developed in this study could be used for bioaugmentation of rapid kitchen waste composting.

Abstract ID: 041459

UNRAVELING THE COMBINED INFLUENCE OF OCEAN WARMING AND ACIDIFICATION ON THE ENERGY BUDGET OF *ETROPLUS SURATENSIS*

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The incessant influx of anthropogenic CO_2 into the atmosphere exacerbated the physiological perturbations of marine organisms. Ocean warming (OW) and ocean acidification (OA) represent two pivotal stressors, whose conjoint effects on marine species particularly fishes, remain largely ambiguous. This study endeavoured to elucidate the physiological energetics of *Etroplus suratensis* under combined OW and OA scenarios over a 30-day mesocosm setup. Fish were subjected to four scenarios: (a) present climate (pH 8.1, 28°C), (b) acidification (pH 7.7, 28°C), (c) warming (pH 8.1, 34°C), and (d) future climate (pH 7.7, 34°C). Key physiological metrics, ingestion, absorption, respiration, and excretion rates, were gauged to assess the Scope for Growth (SfG).Additionally, biomarkers from different biological levels such as antioxidant defenses, detoxification mechanisms, and lipid peroxidation, were evaluated.

The results underscored that the combined stressors conspicuously diminished feeding activities as mirrored by curtailed ingestion and absorption rates. Metabolic depression is noticed in respiration and excretion rates, suggested an energy conservation strategy amidst transient stress. Furthermore, negative SfG indicates that the OAW condition severely compromised the energy allocation strategy of *E.suratensis.* Additionally, Oxidative stress biomarkers such as superoxide dismutase (SOD), catalase (CAT), and glutathione-S-transferase (GST), showed significant elevation; albeit, were inadequate against prolonged stress which resulted in escalated lipid peroxidation (LPO) level. Overall, the synergistic influence of OW and OA significantly wreaks havoc on the energy budget and oxidative stress biomarkers, of *E. suratensis* which might endanger their population structure and ecosystem functionality in the future scenario.

Abstract ID: 090522

ASSESSING SUBNATIONAL ENVIRONMENTAL SUSTAINABILITY IN INDIA

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Environmental sustainability is vital for our survival and that of the earth, socio-economic development should be managed within ecological bounds. But till date, comprehensive research on subnational progress on environmental sustainability is scarce for India. We have gathered scores for the four environmental SDGs i.e., for water and sanitation (SDG 6), climate action (SDG 13), life below water (SDG 14) and life on land (SDG 15) for all Indian states and UTs from the NITI Aayog database, (2018–2020). Using R and Python software, we conducted Pearson correlation, Network analysis, Inequality analysis, Hierarchical Cluster analysis (HCA), Evenness analysis, data envelopment analysis (DEA), as well as comparative performance of Indian states and UTs. Compared to the national, Asian, and worldwide average SDG scores, Odisha, Andhra Pradesh, and Chandigarh are performing better and close to achieve the 2030 target, while others: Rajasthan, Punjab, and Puducherry are well behind. Indian states have moderate positive correlation between environment and economy. Chandigarh, Puducherry, and Tripura are more efficient at producing greater socioeconomic outputs with less environmental input. Many states and UTs may do worse socioeconomically even when they have better environmental scores, and vice versa. The state-level inequality is lower than that of the UTs for the environment. Network analysis of environmental indicators showed varying degrees of centrality, reflecting the complex nature of environmental sustainability efforts in India. Based on the results of this study, tailored context-specific suggestions for policymakers were proposed. India must take decisive actions for achieving environmental sustainability within 2030.

Abstract ID: 112949

EMERGING ROLE OF WOMEN IN SUSTAINABLE ECOLOGICAL DEVELOPMENT AND ADAPTATION TO CLIMATE CHANGE – AN EXPERIENCE OF BONGAON SUB DIVISION, WEST BENGAL DURING THE PERIOD 2017-2024

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In the context of intensifying impacts of climate change around the world, community based initiatives spearheaded by women are showing enduring results in Sustainable Ecological Development and Adaptation to Climate Change in developing countries of Africa and Asia.

The theoretical background of such community based initiatives can best be substantiated by the work of Nobel Laureate American Political Economist Elinor Ostrom on “common pool resources” which states that local communities are the best at managing their natural resources as they are the ones that use them.

According to the United Nations Climate Change chapter, for a long time women having access to natural resources (land, forests, water, fisheries, pastures, etc.), historically developed knowledge and skills conducive to Sustainable Ecological Development through judicious natural resource management including water harvesting and conservation, food preservation and rationing and thereby, found out Climate Solutions.

In this context the Bongaon experience of people’s participation in West Bengal spearheaded by women's organisations in rejuvenation of River Ichamati has set an example of sustainable community based natural resource management initiative contributing to adaptation to climate change. A participatory holistic cleanliness drive by women practicing *Zero Waste Campaign* at the household level coupled with *Community Composting* -based drive for cleaning and rejuvenating an endangered river Ichamati not only contributed in improving the quality of a riverine ecosystem to fight back a pandemic but opened up new livelihood opportunities at the local level resulting in significant changes in the household waste management and public health management scenario conducive to Sustainable Ecological Development and better Adaptation to the Climate Change impacts.

COMPARATIVE ASSESSMENT OF SEASONAL WATER QUALITY VARIATIONS IN THE MAJOR RIVERS OF BIRBHUM DISTRICT, WEST BENGAL

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Birbhum district is shaped by six major rivers namely Ajoy, Kopai, Mayurakshi, Dwarka, Brahmni and Banshloi. They face numerous challenges for increasing anthropogenic threats like agriculture, fishing, livestock farming and sand mining. This study aimed to examine how the water quality differs spatio-temporally across those rivers and identify primary contributing factors to the differences. Sixteen sites were chosen, integrating comprehensive field surveys, seasonal sampling in 3 phases (pre-monsoon, monsoon, post-monsoon) and analysis. Both descriptive and inferential statistics were used for data interpretation. Fifteen physicochemical parameters were utilised to assess water quality and pollution status by employing Weighted Arithmetic Water Quality Index (WAWQI) and Comprehensive Pollution Index (CPI). Inverse Distance Weighting (IDW) method was employed for visualising the spatial and temporal variations. The results showed that fishing has influenced the dissolved oxygen (DO) concentration. Nutrients like phosphate (PO_4), nitrate (NO_3-N), nitrite (NO_2-N) were increased by agricultural activities. Mostly, chemical oxygen demand (COD), chloride content (Cl), and sulphate (SO_4) were observed higher in Ajoy River than the others. Post monsoon water quality was much better than other two seasons. 68.75% of the sampling sites were considered as 'very poor' category with WAWQI value (76-100) and 'slightly polluted' with CPI value (0.41-1). The site of Dwarka River near Tarapith exhibited the highest WAWQI value of 168.05, due to tourism pressures and sewage discharge from nearby cremation site, hotels, and resorts. These outcomes may provide essential baseline data and recommendations for reducing water pollution and will contribute to several policy making and resource management.

Abstract ID: 100343

STATE SPECIFIC AIR POLLUTION EMISSION FACTOR OF OPEN BURNING OF REFUSE MATERIALS

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Abatruct :

Air pollution is a global environmental concern, particularly in developing economies like India, where diversified polluting sources contribute to deteriorating air quality. Inefficient municipal infrastructure for solid waste management leads to unauthorized open combustion of refuse materials, such as biomass materials, cloths, rubber, thermocol, and plastic. There is a significant variation in the composition of biomass materials among different regions, this contributes to variation in emissions when they are combusted. This study developed indigenous emission factor of pollutants *viz.* PM_{10}, $PM_{2.5}$, CO, NO_x, SO_2, VOCs from burning of refuse materials through lab-based controlled combustion of refuse materials collected from municipal vats of 25 major towns of West Bengal with complete personal safety. Study findings revealed that PM_{10} and $PM_{2.5}$ emissions from in-situ burning of waste biomass materials was 17.45 g/kg and 10.82 g/kg respectively. While, $PM_{2.5}$ emission from burning of rubber, plastic, paper and leather materials was observed as 70.50 g/kg, 5.11 g/kg, 2.28 g/kg and 8.57 g/kg respectively. This study aims to reduce uncertainty in developing air pollution emission inventory and guide regulatory authorities in effective solid waste management strategies. The emission factor developed under the study may be further refined by increasing the number of sampling towns/rural areas.

FABRICATION OF MAGNETIC CARBON FROM HIDE TRIMMING WASTE BY PYROLYSIS AND ITS APPLICATION FOR THE RECOVERY OF SODIUM SULPHATE FROM YELLOW SODIUM SULFATE, A HAZARDOUS BY-PRODUCT OF THE LEATHER CHEMICAL INDUSTRY

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Hide Trimming Waste (HTW) is a major solid waste (~7% of initial hide) generated during leather processing. In present study, magnetic carbon (MC) was synthesized in scalable quantity from the HTW by the treatment of iron salt followed by controlled pyrolysis. FTIR and XPS studies revealed that hydroxyl, amine and carbonyl groups were present at the surface of the MC. The XRD and Mössbauer studies exhibited that the mixture of Fe(0) and Fe(II) was responsible for the magnetic property of MC (17 emu/gm; by VSM). Raman spectra revealed the existence of graphitic carbon at the surface of MC. The SEM and TEM studies described the nature of the surface and internal structure of the MC along with the presence of iron nano-particle (~70 nm). The MC was used for the purification of Sodium Sulphate from Yellow Sodium Sulfate (YSS). which is a hazardous by-product generated during the production of Basic Chrome Sulfate (leather tanning agent) from chromite. The efficiency of the purification of YSS was examined by TCLP procedure and XRF analysis. It is noticed that 1gm of MC is capable of purifying 15 gm of YSS from 100 ml acidic solution at pH-1.0. XPS and FTIR studies further confirmed that the presence of surface functionalities were responsible for the reduction of Cr^{+6} to Cr^{+3} in YSS which leads to recovery of Sodium Sulfate with ~99% purity. This study demonstrated that the MC developed from HTW can be an excellent tool for the recovery of pure Sodium Sulphate from YSS.

Abstract ID: 024615

A COMPARATIVE STUDY TO DECODE THE COMBINED EFFECTS OF ELEVATED TEMPERATURE AND PESTICIDE POLLUTION ON MEIOBENTHIC COMMUNITY STRUCTURE FROM INTERTIDAL AND ESTUARINE ECO SYSTEM

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Meiobenthic organisms serve as an essential bio-indicator to gauge ecosystem disturbances. In the era of Anthropocene, elevated temperatures and pesticide pollution are critical environmental concerns. Though meiobenthic organisms are important for ecosystem functioning, the combined effects of above mentioned stressors on meiobenthic community structure remain unexplored. The present study investigates the acute exposure of elevated temperature (34°C) and organophosphate pesticide contamination (chlorpyrifos at 3 $\mu g.L^{-1}$ and 4.5 μg.L{4.5 $\mu g.L^{-1}$) on meiobenthic community from two different eco-regions: intertidal sand-flat and mangrove estuarine system. A 10-days benthocosm experiment unveiled significant declines in total meiobenthic abundance under high stress conditions; 75% and 73% in mangrove and sand-flat respectively. A 4-factor PERMANOVA revealed significant effects of temperature, pesticide, and exposure duration on meiobenthic abundance ($p < 0.05$). Sensitive taxa such as kinorhyncha, bivalvia, and ostracoda were eliminated from treated benthocosms, while nematode assemblages persisted across all treatments. Nematode species composition also affected and shifted under stress, where opportunistic and stress tolerant species were dominant. Nematode abundance decreased up to 65% and 63% in the mangrove and intertidal sand-flat, correspondingly. Species diversity, richness, and Shannon–Wiener index significantly declined, with notable changes in the Maturity Index and Index of Trophic Diversity due to dominance of opportunistic and stress-tolerant nematode species. The effects of combined stressors were more pronounced than individual stressor in isolation and the mangrove estuary displayed slightly higher susceptibility than the intertidal sand-flat. This study addresses the impact of anthropogenic perturbations on meiobenthic community and also underlines the importance of multi-stressor experiments in ecotoxicological research.

A COMPARATIVE STUDY TO DECIPHER BENTHIC COMMUNITY STRUCTURE FROM THE ANTARCTIC OCEAN AND ARCTIC FJORDS

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Benthic realms encompassing both meiobenthic (between 63 to 500 µm) and macrobenthic assemblages (above 500 µm), are governed by specific environmental factors. Polar marine ecosystems portray distinct biodiversity patterns due to extreme environmental conditions. The present study aims to shed light on the benthic community structure from both polar eco-regions (Prydz Bay; Antarctic Ocean and Arctic fjords; Arctic Ocean). The study areas exhibit distinct depth variations, with Antarctic Ocean stations characterised by greater water depth (290 to 3000 m) than the Arctic fjords (50 - 400 m). The Antarctic Ocean exhibits unique environmental conditions which foster a less diverse but specialized benthic community. Contrastingly, Arctic fjords support a diverse and abundant benthic community due to higher and organic matter availability. In the Antarctic Ocean, benthic abundances ranged from (24 - 521 indv. 10 cm^{-2}) and (0 - 1592 indv. m^{-2}) for meiobenthic and macrobenthic communities, respectively. In contrast, Arctic fjords showed higher meiofaunal (41 - 2324 indv. 10 cm^{-2}) and macrofaunal (3867 - 9715 indv. m^{-2}) abundances. Benthic communities in Antarctic Ocean were dominated byfamilies Lumbrineridae, Glyceridae, Ophiuridae, Comesomatidae, Desmoscolecidae whereas Maldanidae, Yoldiidae, Linhomoeidae, Dorylaimidae families prevailed the Arctic fjords. Univariate and multivariate statistical analysis displayed significant difference between benthic communities of both eco-regions. Biological trait analysis (BTA) indicated distinct functional trait diversity across the regions, underscoring the ecological differences between Antarctic and Arctic benthic ecosystems. These findings affirm the influence of distinct environmental drivers in shaping the structural and functional diversity of endemic polar benthic communities.

Impact of Climate Change on Agriculture and Livelihood Adaptation: A Case Study of Sundarbans Region

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Abatruct :

Background:

Climate change is a global threat at present time. It is more intense in the global coast and Sundarbans is no exception. Climate change induced multi hazards frequency has been increased, which has an adverse effect on agriculture which is the major livelihood option of the people living in Sundarbans coast.

Objective:

The study aims to examine the impact of climate change on agriculture and to identify the adaptation strategies by the rural communities of Sundarbans

Methodology:

The study is based on field survey, and a well-structured questionnaire has been used as data collection tool. Households are the social unit and villages are the geographical unit of the study. Villages and households were selected by purposive sampling while households' size was fixed by using Cochran formula. For data analysis descriptive statistics has been used here.

Results:

With increasing frequency of natural hazards, it is said that climate is changing and subsequently these hazards make the rural people's livelihood vulnerable. Agricultural land has become unsuitable due to salt water intrusion for crop cultivation and they have transformed their livelihood from crop cultivation to either aquaculture or non-farm activities.

Abstract ID : 064350

IMPACT OF EXTREME WEATHER ON EMBANKMENT STABILITY IN SUNDARBAN: A CASE STUDY FROM GOSABA

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Sundarban is situated at the southern part of the Ganga-Bhramhaputra delta, developed by the Hugli estuary system having a tidal asymmetry and is characterized by episodic flood. The channel embankment of this region frequently experiences breaching especially during the extreme tropical cyclones. The study aims to find the correlation between spatiality of tropical cyclones and extent of embankment breaching in the Gosaba block. For this purpose historical atmospheric data and embankment change of the study area have been incorporated. Along with that the statistical correlation between yearly frequency, landfall distance, and tidal condition at the time of landfall of cyclones with spatial extent of embankment breaching has been studied. Also multi dated landsat and sentinel-1 images have been used to analyze changes after five severe cyclones from 2020-2024. The changes in the study area after cyclone Remal have been identified through primary field survey with GNSS. After analyzing all this data a positive correlation between cyclone frequency and embankment breaching is found. The effects of cyclones further get intensified when they are accompanied by high tides. Impacts of different cyclones on soil moisture; salinity shows the pattern of salt water flooding caused by embankment breaching. Some measures to protect the embankment are also suggested in this paper.

ANALYSING THE IMPACT OF CLIMATE VARIABILITY ON RICE YIELDS IN INDIA USING MACHINE LEARNING: A META-ANALYTICAL APPROACH

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To ensure food security, it is imperative to comprehend agricultural responses to climate change. Regions like India, where rice is a staple crop face myriad challenges. According to the research, temperature extremes during crucial growth phases, delayed monsoons, and unequal rainfall distribution are some of the main causes of production discrepancies. The growth and development of rice plants can be affected by several biotic stresses like seasonal rainfall patterns, elevated CO_2 concentration, and increase in temperature. Inconsistencies are found in the studies predicting the extent and direction of future climate change impacts on agricultural yields because of variations in study methodology (e.g., crop models, climate models, and climate scenarios). Here we use Meta-analysis and Machine Learning to establish an evidence-based practice and reconcile incongruous findings from that research. The study compares actual and potential yields under optimal conditions to predict future yield trends under different climate scenarios and helps to validate machine learning models' findings. Meta-analysis also explores the heterogeneity of climate impacts across India's diverse agro-climatic zones, providing insights into region-specific vulnerabilities. It is critical to implement targeted interventions and climate-resilient agricultural practices to close yield gaps, boost productivity, and increase food security in India.The study utilizes machine learning's predictive capabilities to enhance climate adaptation and sustainable agricultural development, providing policymakers with valuable insights for region-specific rice production mitigation.

ASSESSING LAND SURFACE TEMPERATURE VARIATIONS IN SOUTH 24 PARGANAS: THE IMPACT OF CLIMATIC, DEMOGRAPHIC AND SOCIO-ECONOMIC FACTORS

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The Land Surface Temperature is a critical measurement in the comprehension of the climate system of the Earth, acting as an indicator of the energy exchange between the land surface and the atmosphere. The current research study monitors the spatial distribution of LST over South 24 Parganas, the largest district of West Bengal with significant urbanization, population growth, and degradation of the environment. The study tries to find out whether the present day LST condition is the resulting product of long-term interplays between climatic, socioeconomic and demographic factors of the study region or not. Using single window algorithm, the study depicts a remarkable concentration of LST (>Mean + 2SD) in Sonarpur-Rajpur municipality, Baruipur and Jaynagar I and II. Using the Mann-Kendell test on climatic, social, economic and demographic factors, it is found that population density has increased steadily but has less impact on LST while built-up areas have a direct impact on LST though their growth rate is less. Moreover, partial correlation signifies a significant and larger impact of long-term climatic factors (Solar Radiation, Evapotranspiration, precipitation, etc.) compared to sociodemographic variables. Therefore, this study calls for a well-structured and Nature Based Solution to combat climatic variability as a solution for restricting extreme LST distribution and associated health issues.

DECODING THE MAN-NATURE-SOCIETY TRIAD: A CASE STUDY BASED EXPLORATION AMONG THE AGRICULTURAL VULNERABLE FARMING COMMUNITIES IN COASTAL WEST BENGAL

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The comprehensive triangulation of natural and social space impacts the cognitive space of man and his decision-making capabilities. This study is a novel and experimental exploration of how the accumulated association of the natural and socio-economic components shape the cognitive perception of man living in a vulnerable physical space. Set in the Namkhana district of coastal West Bengal, the spatial differentiation of agricultural vulnerability has been attributed with 7 exposure (natural space) variables, 9 sensitivity and 8 adaptive capacity (socio-economic space) variables within a Principal Component Analysis framework. Next, farmers' perception about the changing nature of climate and its impacts on agriculture has been collected from 6 villages lying within 3 different vulnerable zones. Using Ordinal Logistic Regression model, the study found that farmer's cognitive space is particularly shaped in 2 different ways. For those natural components which are predominant and homogenous, farmers' perception about those components is also likely the same among all vulnerable zones. Contrarily, where the natural components are heterogeneous in nature, socio-economic factors play a pivotal role in those contexts and the more vulnerable communities found themselves to be in more distressed condition compared to the actual distressing situation. This certainly impacts the mental health of the farming communities and a sense of fear about the future is predominant among the vulnerable ones. This study, therefore, suggests a structured dissemination of climatic knowledge and associated perils among the marginalized communities to build a healthier cognitive space among the vulnerable farming communities in coastal West Bengal.

Abstract ID: 115351

INTEGRATING EMERGING TECHNOLOGIES FOR SUSTAINABLE DEVELOPMENT AND DISASTER RISK REDUCTION: TRANSFORMATIVE STRATEGIES FOR COMMUNITY ENGAGEMENT UNDER CLIMATE CHANGE SCENARIOS IN COASTAL SOUTH 24 PARGANAS, WEST BENGAL, INDIA

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This study examines the nexus of climate change, vulnerability, and infrastructure development in South 24 Parganas, West Bengal, India, through the lens of community engagement and sustainable development. Grounded in the Sustainable Livelihoods Framework (SLF) and Disaster Risk Reduction (DRR) principles, this research employs geospatial analysis, remote sensing, GIS, and AI/ML applications to investigate climate change impacts on indigenous communities in the Indian Sundarbans. The findings reveal alarming trends: a 35% increase in flood frequency and 25% rise in sea levels between 1990 and 2020, 40% loss of mangrove cover exacerbating flood vulnerability, and 75% of displaced households experiencing reduced income and food insecurity. Moreover, AI/ML models predict a 20% increase in cyclonic activity by 2030. To address these challenges, the study develops a Flood Susceptibility Index (FSI) and informs a District Disaster Management Plan (DDMP). The results highlight the need for inclusive decision-making, participatory approaches, environmental sustainability, and human rights in development planning. The study recommends integrating AI/ML for climate prediction and decision-making, implementing ecosystem-based adaptation (EBA) measures, promoting climate-resilient infrastructure and agriculture, and ensuring participatory approaches and social equity. This research contributes to the advancement of SLF and DRR principles in climate resilience research and demonstrates AI/ML applications in climate modelling and decision-making. Methodologically, it integrates geospatial analysis, remote sensing, and AI/ML for climate risk assessment and develops FSI and DDMP for effective disaster management.

Abstract ID: 115924

CHANGING PATTERN OF AVIFAUNA-A FIVE YEAR STUDY IN RABINDRA SAROVAR LAKE, KOLKATA IN THE CONTEXT OF LULC CHANGES

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Urbanisation is a global process contributing to the loss and fragmentation of natural habitats. Urban green spaces play a crucial role in reducing the urban heat island effect and helps in maintaining the climate resilience. Due to the rapid urbanisation and changing land use pattern in Kolkata and its peri-urban areas, urban green space has been reduced considerably and becoming more vulnerable. Rabindra Sarovar, a national lake located in the southern part of Kolkata is famous for its rich biodiversity. Presently, this lake is one of the major urban green spaces available for both terrestrial and aquatic flora and fauna. In the present study, the data of avian faunal diversity (including both resident and migratory birds) recorded periodically over continuous 5 years' timescale. Around 122 species have been recorded from this study along with the observations of different kind of anthropogenic activities. Among them 40 species of birds were recorded for the first time in the study area. This study focused on species richness, abundance, foraging behaviour and diversity pattern of different bird species. Results indicate a probable fluctuation in the avian diversity with parallel seasonal microclimatic variation. Density and diversity of the avifauna and their fluctuations recorded during this study might be related with both urbanisation and changing pattern of land use and land cover.

IMPACT AND ADAPTATION OF CLIMATE CHANGE ON COASTAL AGRICULTURE OF WEST BENGAL: A CONFLICT BETWEEN SUSTAINABILITY AND PROFITABILITY

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The increasing trend of climate variability and climatic extremes severely affects the agricultural sector in the era of climate change. Since IPCC has characterised coastal areas as one of the most vulnerable to climate change-induced phenomena, agriculture and agrarian livelihood of coastal communities are on the front line of this harsh situation. Therefore, assessing vulnerability and its degree of severity at the ground level is important to cope with the situation. In this background, this study analysed the recent trend of climate variabilities like rainfall, temperature, and tropical cyclones and their impact on the agriculture of the Purba Medinipur Coastal area, West Bengal. An integrated methodology has been applied, combining geospatial and empirical techniques to fulfill the objectives of the study. A village level primary survey was conducted intensively to assess the actual situation of agriculture in the changing climatic scenario. The study also investigated the local adaptation strategies and the factors influencing the decision-making system of the farmers by applying a logistic regression model. Overall the result shows that the cropping calendar of the study area for the principal crop has been significantly affected by rainfall variability. A shift of livelihood from subsistence rice farming to commercial shrimp farming has been noticed, causing a severe threat to sustainable agriculture. Finally, the findings of the study would help the policymakers and local agricultural stakeholders in making climate resilience adaptive strategies and better management for coastal agriculture.

REVISITING INDIGENOUS TECHNICAL KNOWLEDGE OF MENSTRUAL PRODUCTS & ITS EVOLUTION: A CASE STUDY OF TEA GARDEN WORKERS IN DARJEELING DISTRICT, WEST BENGAL

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Introduction : This case study examines the shift in menstrual hygiene practice of female tea garden workers in Darjeeling, West Bengal. Traditionally, they relied on locally available, natural methods that were most often used for menstrual care. Over time, however, mass-produced commercial sanitary napkins have become readily available and thus there has been a shift. This paper revisits indigenous technical knowledge and identifies some problems with using new hygienic products.

Objective : This mainly focuses on the socio-economic and cultural factors that shape the selection of menstrual products, where there is an intergenerational difference between older and younger women. It also tries to analyze the degree of satisfaction that women have with modern sanitary pads as well as the possible advantages and challenges of blending traditional practices with modern needs.

Methodology : In-depth interviews, focus group discussions, and participatory observations were conducted with female tea garden workers using a qualitative and quantitative research approach. The different age groups of women are the source of the data. This is because their varied generations' points of view will be achieved. There are recurring themes identified in menstrual product preferences, cost-effectiveness, and environmental impact through analysis. To map QGIS3.18 has been used and SPSS 20.0 for statistical analysis.

Results : Results from the findings have shown that a generation gap exists in preference regarding the use of sanitary pads and clothes. The old people opt for the clothed version because it is less costly and friendly

to the environment while the young opt for commercial sanitary pads although they complain that they are not comfortable and expensive and detrimental to the environment. In general, the study highlights the dissatisfaction of most of the youth with the use of these modern sanitary products on the basis of discomfort, expense, and difficulty in proper disposal. This dissatisfaction emphasizes the need for a hybrid solution, which will bring the advantages of traditional knowledge with the benefits of modern solutions.

Conclusion : The study thus proposes that indigenous knowledge is important and that a hybrid model could be the way to go. It will ensure that traditional wisdom blends well with the convenience of modern products to offer comfortable, eco-friendly, and affordable options for all age groups.

Abstract ID: 040829

WATER SCARCITY AND MIGRATION PATTERNS : ANALYZING THE ROLE OF WATER STRESS IN GLOBAL MIGRATION TRENDS

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Background: Traditionally, water migration was associated with nomads and pastoralists seeking food and water for their animals. However, the most massive refugee flows since the Second World War are occurring today due to a lack of water. Today, the migration resulting from water-related issues is one of the greatest global challenges. Policies on water are targeted at enhancing the resilience of populations and regions to climate change and water risks that may cause unwanted migration.

Methodology: Secondary sources from trustable journals and website publications have also been used, data for the research metadata was analyzed using the statistical package (SPSS 20) version, and the map by QGIS 3.26 versions.

Results: Some integrated water-migration database would be required to better understand the early warning signals of damaging water hazards that might lead down undesirable migration channels. Furthermore, it will focus water policies directly toward strength in vulnerable regions and their populations about global climate change. A way of thinking newly, either systematically or in a panoramic way, over the various connections between water changes, and changes in migration patterns, is also part of the demand.

Conclusion: Previous studies have documented several migration cases with strong associations with water-related events. However, there is a lack of comprehensive synthesis that may help to understand how different factors of physical water systems shape human migration.

Abstract ID: 023921

WATER WISDOM: INDIAN PERSPECTIVES ON CONSERVATION AND SUSTAINABILITY

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Introduction

India, a land with diverse landscapes and a rich heritage, has special ways to conserve water. “Water Wisdom” explores traditional knowledge of India and emerging practices designed to mitigate water scarcity and protect resources. This is how ancient wisdom has merged with modern sustainability efforts to help India forge its path toward becoming water-resilient.

OBJECTIVE

This paper explores approaches to water conservation in India, specifically how traditional wisdom is now being combined with modern sustainability practices. Its aim is to consider the techniques of indigenous water management to build awareness of sustainable water use and contemporary strategies.

Methodology:

This study has adopted the mixed-method approach with a combination of qualitative and quantitative data. Primary data are generated through interviews with the local communities, environmentalists, and policymakers, and secondary data consist of reports, case studies, and literature regarding traditional and modern water-saving practices. Comparative analysis will be used to evaluate effectiveness across India. To map QGIS3.18 has been used and SPSS 20.0 for statistical analysis.

Result:

Through this paper, you find dynamic integration in respect to the old and modern ways applied to the overall conservation efforts on water from India. Regions that utilise the old methods like step-wells and harvesting by rain show that more benefits of better availability are garnered especially for the arid and semi-arid locations. Further development and solidification of modern approaches involving groundwater recharge projects as well as electronic water resources' supervision has augmented water management efficiency but generally costs more than earlier practices. The highest level of sustainable outcome is found in areas that combine traditional wisdom with modern technology. This might be the preservation and utilization of resources over the long term with maximum community involvement. The results indicate that balanced approaches, which take care of both cultural practices and innovation, provide the best solutions in conservation.

Conclusion:

This balance between traditional and modern innovations sums up the success of India's water conservation. The results of this research suggest that the areas with a hybrid approach of implementing indigenous techniques, like rainwater harvesting, and more advanced water management technologies show a higher level of sustainability and community involvement. The integral strategies enhance the availability of water while giving the much-needed resilience against climate variability. Securing water for future generations in India therefore calls for the respect of culture and technological adaptation in balance.

Abstract ID: 042658

"URBAN SLUM SANITATION CRISIS: EVALUATING ACCESS, INFRASTRUCTURE, AND HEALTH IN KOLKATA'S DUTTABAD SETTLEMENTS"

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Introduction: The sanitation crisis within urban slums continues to be a striking public health problem, particularly in the politically growing areas with poor facilities. This study highlights impacts of the sanitation, its practices and facilities within the Duttabad settlements in Kolkata, West Bengal. Duttabad, an urban slum is known to be over-populated, with about 30% of the inhabitants having access to safe water and limited waste disposal systems, all accounting for poor hygiene and health.

Methodology: The study used a cross sectional descriptive design in which surveys and observational analyses were helpful in assessing sanitation and sanitation practices and infrastructure. Quantitative data focused to understand the state of water and sanitation and health complaints. Qualitative data was focused to obtain the relation between sanitation and poor health.

Results: Results display that not more than 40% households dispose of fecal matter in adequate sanitation facilities further almost all households complained of sewer overflowing and contamination of water sources. About 60% of resident's experiences various health issues but children and older people were mostly affected. In addition, the results show that there is a glaring gap in the provision of waste management services which impacts the environment and health negatively.

Conclusion: From the research conducted, the most important aspect that needs to be improved in Duttabad is sanitation and solid waste management. These two can be ensured if the awareness of the local population was increased and the local authorities back them up.

Abstract ID : 094126

IDENTIFICATION OF ALUMINUM AND FLUORIDE INDUCED STRESS MARKERS/ VARIATIONS IN *AZOLLA FILLICULOIDES* PLANTSUNDER ACID SOIL STRESS CONDITIONS

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Soil acidification (pH < 5) restricts the entry of essential nutrients like phosphorus, magnesium and calcium in a plant system. Further, the toxic forms of certain elements like aluminum, fluoride and manganese are formed in soil solution under acid soil conditions. Importantly, aluminum (Al) and fluoride (F) phytotoxicity problems are prevalent in acid soil areas, accounting for significant loss in global crop productivity. Both Al and F induce irreversible cellular and molecular changes in the root system; inhibit root elongation and result in stunted plant growth. In this present study, we have identified significant variations in the phenotypes of *Azolla filliculoides* plants under Al and F stress conditions. *Azolla filliculoides*, a pteridophyte is a promising candidate for nitrogen supplication and phytoremediation properties. Since key genes involved in phytoremediation remain unexplored in *Azolla filliculoides's* genome, identification of keys genes involved in Al and F stress are critical for understanding Al and F stress tolerance mechanism. For phenotypic variations, root traits analysis and microscopic imaging are done to distinguish between control and stress condition. Taken together, the results observed in the above study may possibly be useful as a marker to differentiate the normal plants from the acid soil stress affected plants.

Abstract ID: 121946

ASSESSMENT OF ALUMINIUM AND SALT STRESS INDUCED VARIATIONS IN THE ROOTS OF RICE PLANTS

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Plant metabolism and growth stages are severely affected by different stress conditions in rice plants and cause reduced crop yield. In particular, several reports pointed out that the shoot traits of the rice plants are severely affected and very few studies have focused on the root traits. Hence, we assessed the root traits in this study under salt and Aluminium (Al) stress conditions. In continuation, we examined different root traits and all the root trait parameters were significantly altered in the rice seedlings. The root biomass, total root length, primary and secondary root growth of the rice seedlings were significantly altered by different concentrations of salt and Al. Importantly, the root hairs observed in primary, secondary and tertiary root showed significant alteration when compared with control plants. Further, remarkable changes were also recorded in the conductive tissue of rice roots under above stress conditions. We also observed significant change in proline and chlorophyll contents in rice seedlings. Our results clearly indicating the variations in the root traits of rice plants challenged with salt and Al stress. The impact of salt and Al stress on shoot phenotypes and biochemical marks will also be discussed in the presentation.

Abstract ID: 093457

COMPETITION BETWEEN NATIVE SUBMERGED MACROPHYTES *NAJAS INDICA* AND INVASIVE *VALLISNERIA SPIRALIS* IN COMMUNITY AND THEIR CYTOLOGICAL AND PHYSIOLOGICAL EFFECTS ON EACH OTHER

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The competition among different species of submerged macrophytes are not as well-known as compared to the terrestrial invasive weeds. Although the submerged macrophytes play a crucial role in maintaining freshwater ecosystems as clear water bodies and prevent harmful algal blooms. However, some opportunistic submerged macrophytes like *Vallisneria spiralis* can become invasive with their high adaptability and fast vegetative propagation. Global warming is a threat to the native biodiversity including those in aquatic ecosystems. So, it is important to understand the dynamics of the invasive macrophytes affecting the native flora and fauna. Here, the interaction between the invasive macrophyte, *V. spiralis* and a native submerged macrophyte, *Najas indica* is observed under controlled warm water conditions to determine the more dominant submerged macrophyte and the effects of these macrophytes on each other. It was seen that *V. spiralis* is the dominant submerged macrophyte over *N. indica* in terms of growth rate and significantly high frequency of chromosomal aberration (52.22% ± 4.01) was observed in root tip cells of *N. indica*, when it was co-cultured with *V. spiralis*, compared to the monoculture of *N. indica* (6.21% ± 3.98). This study should help in understanding the aquatic macrophyte interactions and their long term effects.

Abstract ID: 114335

ENVIRONMENTAL FLOW ASSESSMENT (EFA) OF MAHANANDA RIVER: A CASE STUDY

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The determination of the minimum discharge volume required for the survival of the native aquatic species is known as the environmental flow assessment (EFA) of a river. The current study examines the Mahananda River's reach-specific environmental flow at the Gulma and Siliguri stations in the Sukna geomorphic zone, which is located in the Darjeeling district of West Bengal, India. The e-Flow at this ungauged site of the Mahananda River was measured using the discharge-wetted perimeter curve method using RL data extracted from the field, while the volume of environmental flow at the Siliguri stretch was estimated using the daily discharge data extracted from the Geoglows-Hydroviewer data repository. According to the discharge-wetted perimeter method, a minimum stream discharge of 26 m^3s^{-1} in the Mahananda River at Gulma may be required to meet the sustainable ecological demand of the native riverine ecosystem. In contrast, the Tennant, Tessman, and Smakhtin models, respectively, require environmental flows of 40, 80, and 15 m^3s^{-1} in the Mahananda River at Siliguri reach. The current study's findings undoubtedly provide the local government insight into the need to maintain an 80 m^3s^{-1}flow in the Siliguri section of the Mahananda River year-round, regardless of human intervention, in order to ensure the river's survival.

ZOOLOGY

SINGED AND ARP2/3 COMPLEX IN VIVO REGULATES F-ACTIN DYNAMICITY DURING BORDER CELL MIGRATION IN *DROSOPHILA*

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Border cells are a cluster of follicle cells that migrate during *Drosophila melanogaster* egg chamber development and have been used as a genetically tractable model to study collective cell migration (CCM). Cell migration, single or collective, is important during development, wound healing, and tissue morphogenesis as well as in diseases in multicellular eukaryotes. Like single-cell migration, the actin cytoskeleton plays a pivotal role in regulating forward and retraction movements, protrusion formation and shape changes of migrating clusters during collective cell migration. Obviously, regulation of F-actin filaments during CCM is indispensable and is controlled by a plethora of ‘actin-interacting proteins. In this work, through genetic interaction studies, we tried to decipher signaling pathways through which some actin-interacting proteins can regulate F-actin and border cell migration. We found that the parallel actin bundles cross-linker Singed (vertebrate homolog Fascin) and filament branching protein Arp2/3 complex, genetically interact to regulate F-actin and migration of border cells. Knockdown of both *singed* and *Arp2* showed a substantial increase in migration defects and a reduction in F-actin density in the cluster. Our data also indicates that double knockdown border cells show changes in the border cell cluster's shape and protrusion. Differential dynamic microscopy analysis shows a lesser diffusion coefficient in the absence of *singed* and *Arp2* clusters over control clusters. Furthermore, we uncovered that *singed*, and not *Arp2,* is regulated by *Rac1*, *Rok* and *WASp*. Moreover, *singed* is also regulated by *Arp2*. The work, thus, indicates the redundant role of Singed in border cell migration.

TBX20, A T-BOX TRANSCRIPTION FACTOR FUNCTION IN CARDIAC FIBROSIS

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Adult major cardiac resident cells include but not limited to cardiomyocytes, fibroblasts, endothelial and smooth muscle cells. Among non-myocyte populations, cardiac fibroblast is the most prevalent cell type in the heart and function in both cardiac development and in disease. This cell is responsible for extracellular matrix (ECM) homeostasis in the healthy heart. Adult cardiomyocytes have little to none regenerative capacity. Upon cardiac injuries and death, cardiomyocyte trigger the fibroblast activation and secretion of injury induced ECM proteins including collagen to prevent cardiac wall rupture and death. But the dysregulated and extensive fibrosis can result in subsequent cardiac dysfunction and heart failure. As a result of extensive ECM protein deposition in the place of loss cardiomyocytes, a fibrotic scar is formed identified as replacement cardiac fibrosis. Tbx20, a T-box transcription factor, plays a critical role in cardiac development. Gene targeted studies show that ablation of cardiomyocyte specific *Tbx20* leads to severe cardiomyopathy but overexpression of cardiomyocytes specific *Tbx20* associated with cardiomyocytes proliferation in both fetal and adult stages. Microarray study showed that this cardiogenic transcription factor is also expressed in adult cardiac fibroblasts with unknown functional significance. Therefore, in this study, we have generated and characterized an isoproterenol mediated adult cardiac fibrosis model and shown concomitant increase expression of Tbx20 and other fibrotic genes *in vivo* and in cultured adult cardiac fibroblasts *in vitro*. In addition, siRNA mediated knock-down of *Tbx20* represses the expression of fibrotic markers *α-SMA* and *Col-III i*ndicative of direct/indirect gene regulation by Tbx20. Overall, our data clearly identified Tbx20 as novel regulator in cardiac fibrosis biology with new therapeutic intervention.

IDENTIFICATION OF A NOVEL FUNCTION OF SIRT1 IN ATTENUATING VASCULAR CALCIFICATION UPON INDUCTION OF HYPERGLYCEMIC INJURY VIA TWIST1/GAL3/RUNX2 SIGNALING PATHWAY

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Type 2 diabetes (T2D) is one of the global public health problems and increasing incidence of diabetes-related illnesses and impairments has a substantial negative impact on healthcare costs, productivity and life quality. This could not only create a serious burden to individuals and families but due to its high prevalence rate, it poses a huge threat to the overall health system. It is reported that diabetic individuals of 18 years and older are more susceptible to cardiovascular diseases (CVDs). Due to global concern now a days it is important to find out probable signaling cascade of the correlation between diabetes and CVDs. Type II diabetes has a close relation with vascular calcification (VC) through activation of different transcription factors and osteogenic regulators. Sirtuin1 (SIRT1), a NAD^+ dependent deacetylase plays a beneficial role in VC caused by high glucose. Here, downstream signaling pathway of SIRT1 in VC under the influence of hyperglycemic environment was examined in vivo and in vitro. Vascular smooth muscle cells (VSMCs) were isolated from rat aortic tissue cells are exposed to high glucose environment. This study revealed a significant reduction in SIRT1 and TWIST1 level while Gal3, RUNX2 and BMP2 levels were elevated. SIRT1 activator SRT1720 causes reduction in alizarin red staining through activation of TWIST1 and inhibition of GAL3/RUNX2 pathway. This study reveals the protective role of SIRT1 and TWIST1 in VC within a diabetic environment via inhibition of Gal3/RUNX2 pathway. Therefore, manipulation of this pathway may serve as a therapeutic strategy for the treatment of VC in hyperglycemic condition.

Abstract ID: 095143

MORPHOLOGICAL ORGANISATION OF THE SOMATIC BARRIER BETWEEN THE DEVELOPING MALE AND FEMALE GAMETES IN THE GONAD (OVOTESTIS) OF A HERMAPHRODITE MOLLUSK, *ONCHIDIUM TYPHAE* (BUCHANNAN, 1800)

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*Onchidium typhae*is a protandrous simultaneous hermaphrodite mollusk. The gonad (ovotestis) of the *O. typhae* is a single globular mass, comprised of numerous small ovoidal acini. Each acinus is the source of developing male and female gametes, which are circumscribed by a somatic cell barrier. The present study describes the morphological organisation of the somatic barrier between the developing male and female gametes in the ovotestis of O. *typhae*. Sertoli cells and follicle cells are chiefly involved in forming the somatic barrier. The Sertoli cells are spermatogenesis-promoting, while the follicle cells are oogenesis-promoting cells. There are three different types of somatic cell barrier; the Sertoli cell barrier, follicular barrier, and folliculo-sertoli cell barrier, and their development is directly associated with the development of various stage-specific oogenesis. The oogenesis is accomplished by five different developing stages, each of which is confined by a well-developed somatic barrier. The cell surface of the oogonia is bounded by the somatic layer of only Sertoli cells, and the follicle cells are gradually introduced into the somatic layer and finally ascendant with the increment of oogenesis progression. The study shows comprehensive facts on the development and the morphofunctional association of the somatic cells and the gametogenic cells in the ovotestis of hermaphrodite mollusk. The histomorphological features of the somatic barrier around the developing gametes advocate that the hermaphrodite mollusk is adapted to avoid direct contact between the male and female gametes in their hermaphrodite gonad.

CALLYNTRURA (CALLYNTRURA) BICOLOR, A NEW COLLEMBOLA (ENTOMOBRYIDAE: SALININAE), DISCOVERED FROM THE NORTHERN HIMALAYAN REGION OF WEST BENGAL, A BIODIVERSITY 'TREASURE' ZONE

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The northern region of West Bengal, part of the Eastern Himalayas—an established biodiversity hotspot—receives annual rainfall between 2,500 to 3,500 mm. This high-moisture environment supports brown forest soil rich in endemic vegetation. Such conditions are favourable for Collembola (springtails), crucial arthropods in soil formation due to their role in decomposing leaf litter, decaying wood, and bark. For the present study, specimens were collected during 2022-2023 using mouth-operated aspirators from leaf litter and organic soil layers and bush beating. Prior to this study, 33 Collembola species were documented in the northern hills of West Bengal. The recent survey identified 20 additional newly reported species to the state, including 12 from this region. Notably, a new species, *Callyntrura (Callyntrura) bicolor* sp. nov., is discovered. This species, under the family Entomobryidae, exhibits distinct morphological traits, including a unique black and yellow color pattern, specialized labral papillae, modified claw structure, and an elongated mucro. These features clearly differentiate it from other 30 worldwide species of the subgenus. Following this discovery, a total of eleven species under the subgenus *Callyntrura* are now recorded from India, emphasizing the ecological and taxonomic importance of this region as a repository of previously undocumented species. The discovery of *Callyntrura (C) bicolor*s pnov. highlights the ecological significance of this region, underscoring its status as a reservoir of endemic and undiscovered taxa.

IMPACT OF ARSENIC EXPOSURE ON ANTIBIOTIC RESISTANCE OF MAMMALIAN GUT BACTERIA

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Antibiotic resistance compromises the efficacy of antibiotics and is emerging as a global public health concern. While overuse of antibiotics is a primary contributor, the ubiquitous presence of heavy metals in the environment also plays a crucial role in the proliferation of antibiotic-resistant bacteria. This study investigates the post-exposure impact of Arsenic (As) on the antibiotic resistance of mammalian gut bacteria.

Wistar rats were exposed to sub-chronic doses of Sodium Arsenite ($NaAsO_2$), keeping vehicular control. Quantification by Atomic Absorption Spectroscopy (AAS) confirmed arsenic deposition in As-treated animals.

From gut samples of the model animals, 79 As-resistant bacterial strains were isolated, characterized, and identified. The prevalence of As-resistant strains was higher in the treated group (59.62%) than in the control (35.88%). Bacteria from the treated group exhibited resistance against all 27 antibiotics tested, but the control group isolates were resistant against only 16. Multiple Antibiotic Resistance (MAR) index was nearly tripled in the As-treated group (0.211) compared to the control group (0.076).

Higher resistance rates (23.1-69.2%) were found against 11 out of 15 cell wall synthesis inhibitor antibiotics, compared to those who target bacterial nucleic acid synthesis (3.8-19.2% resistance rates were shown against 9 out of 11 antibiotics of this category). This indicates that antibiotics inhibiting bacterial cell wall synthesis are more likely to encounter resistance than those inhibiting nucleic acid synthesis.

Outcomes of this study demonstrate a significant alteration in the antibiotic-resistance profiles of mammalian gut bacteria, potentially opening a novel avenue for understanding arsenic-toxicity and its interplay with antibiotic-resistance.

ASSESSING THE ADAPTABILITY AND RESILIENCE OF WASTE-EATING BIRDS IN GREATER KOLKATA LANDSCAPE THROUGH DATA-DRIVEN ANALYSIS

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The Greater Kolkata area has seen a rapid decline in wetlands and green spaces due to urbanization in recent years. The conversion of natural land for construction and road development has significantly impacted various animal habitats, including birds. The urban sprawl has resulted in a severely fragmented landscape, with isolated patches of good bird habitat surrounded by highways and structures that frequently operate as barriers, even to mobile organisms like birds. However, the impact on urban bird populations has not been well-documented. Non-forest species of waste-eating birds, such as vultures, kites and crows, play an important part in urban ecosystems. These birds have adapted successfully to urban environments, with diverse diets and nesting patterns. There is limited knowledge about how these birds shift their foraging patterns in urban environments. To address this gap, we propose a model to study the waste-eating bird population in Kolkata using NASA Earth observations and data from the eBird India network. In order to gain in-depth insights on the ecology of urban birds and their habitats, our model focuses on combining high-resolution satellite data with machine learning approaches. With an emphasis on their population distribution fluctuations, adaptability, and resilience, our goal is to better understand the dynamic urban bird communities. The purpose of this study is to provide insight into the various ways in which urban birds recycle nutrients and maintain microclimates in urban areas.

KINASE-KINASE INTERACTIONS DURING COLLECTIVE CELL MIGRATION; STUDIES ON *DROSOPHILA* BORDER CELLS

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The migration of cells is an attractive and crucial biological phenomenon. It is essential to maintain normal homeostasis, but it is found during diseases like wound healing, cancer metastasis etc. This cell migration is majorly of two types. They can migrate individually or in groups. The latter is known as collective cell migration. *Drosophila* border cells (BC) are an excellent example of collective cell migration. In a female *Drosophila*, during stage 9 of oogenesis, a group of 6-8 cells detaches from the anterior part of the egg chamber and migrate between the nurse cells to reach the border of the oocyte by the completion of stage 10. Par-1 is a serine-threonine kinase and a cell polarity protein that mediates the detachment and directional protrusions of the border cell cluster during migration. Different kinases and their interactions with other kinases are known to occur in many cell migration events. Such examples are also found in BC as the Par-1 kinase interacts with Atypical Polarity Kinase C, and 14-3-3 kinase, to name a few. We performed an RNAi screening to determine the interaction of different genes with *par1*. We found pelle kinase, the *Drosophila* homologue of mammalian IKK from the toll signalling pathway that shows a genetic interaction with *par1*. Currently, we are trying to understand, that how this genetic interaction effects the phenotype and migration of BCs. This will give us novel insights into kinase-kinase interactions during collective cell migration that can be studied further.

TEMPORAL VARIATION OF ODONATA (DRAGONFLIES AND DAMSELFLIES) DIVERSITY IN AN URBAN MANAGED HABITAT AT ECOPARK, KOLKATA

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Urbanization often transforms natural habitats into human-modified landscapes, affecting faunal composition, including insects such as Odonata (dragonflies and damselflies). This study aimed to assess the temporal variation in Odonata diversity and abundance in a managed habitat at Ecopark, an urban park. Field data were collected using point count and belt transect methods across three seasons of a year. Various indices, including Shannon diversity index (H'), Simpson's index (D), Margalef's index (d), and Pielou's evenness index (J'), were used to understand the health, richness, and balance of the ecosystem. A total of 41Odonata species (20.5% of the species recorded in West Bengal) belonged to 2 suborders, 6 families and 3,820 individuals were recorded. Suborder Anisoptera (dragonflies) were dominant, comprising 73.17% of species, while the rest 26.83% species were belonged to the Zygopetra (damselflies). Libellulidae family of Anisoptera was the most prevalent. Species richness peaked in the premonsoon season with 37 species and 1,320 individuals, while abundance was highest during the monsoon (1,554 individuals). Shannon diversity index (H' = 3.039) and Pielou's evenness index (J' = 0.6331) were greatest during post-monsoon, and Margalef's index (d) reached 5.01 in pre-monsoon. Simpson's index (D) was lower (0.9009) in monsoon season as *Pantalaf lavescens* dominated the community. While overall diversity (H' = 3.03, D = 0.932) indicated a diverse Odonata community, with seasonal variations. The results revealed significant seasonal variations in diversity. The study concluded that habitat heterogeneity, seasonal dynamics play a role in shaping Odonata diversity and abundance in urban landscapes, emphasizing the importance of conserving wetland habitats in urban areas.

Abstract ID: 014421

REGULATION OF MICROTUBULE BY TWO SERINE/THREONINE KINASES - PAR-1 & SGG DURING COLLECTIVE CELLS MIGRATION: A BORDER CELLS PERSPECTIVE

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Migration of cells is crucial in various biological aspects and an area of extensive study; however still our knowledge is limited on how cells move in a coordinated manner, in a cluster or group *in vivo*. During *Drosophila* oogenesis, 6-8 epithelial-derived migratory cells (border cells) surround a pair of non-motile anterior polar cells forming a cohesive cluster, detach from anterior follicle cell layer, and migrate between germline nurse cells to reach the oocyte border. The border cells migration is an excellent model for studying the molecular and cellular pathways that govern collective cell migration *in vivo*. On the other hand, microtubules are involved in the regulation of various cellular functions including cell migration. On that context, we are studying the microtubule regulation by two serine/threonine kinases – Par-1 and Shaggy (Sgg) during border cells migration. Par-1/MARK phosphorylates various microtubule-associated proteins (MAPs) and regulate microtubule stabilization. *Drosophila* Shaggy (mammalian GSK-3β) can also regulate microtubules in a similar manner. Our study reveals microtubules affected by both Par-1 and Sgg during border cells migration as they might regulate a few downstream MAPs. Thus, this study might give an insight about the broader aspect on the regulation of microtubules in cells, migrating in clusters and better understanding of disease models like cancer.

Abstract ID: 014731

DISENTANGLING THE IMPACT OF ENVIRONMENTAL PARAMETERS IN STRUCTURING THE FUNCTIONAL DIVERSITY AND MACROBENTHIC ASSEMBLAGES OF SUNDARBANS ESTUARINE SYSTEM USING TRAIT BASED HIERARCHICAL MODELLING

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Sundarbans Estuarine System (SES) are dynamic environments where macrobenthic abundance is influenced by seasonal variations. This study investigates the impact of monsoon-driven environmental shifts in macrobenthic assemblages of Thakuran, SES, using a combination of ordination and hierarchical modelling techniques. Hierarchical Modelling of Species Communities (HMSC) was applied to decipher species trait-environment relationships and assess the functional traits, and species associations across pre-monsoon (PreM), monsoon (Mon), and post-monsoon (PM) seasons. Between class analysis depicted significant difference (p=0.0001) in environmental parameters between seasons. 119 macrobenthic species belonging to 6 phyla and 73 families were recorded during the faunistic surveillance with polychaetes comprising more than 50% of the total species. Maximum macrobenthic abundance of 21953 ind.m^{-2} was observed during PreM that drastically reduced to 7948 ind.m^{-2} and 7928 ind.m^{-2} in Mon and PM respectively. Functional diversity indices displayed distinct spatio-temporal patterns, with higher values recorded in downstream stations during Mon. 20 functional traits in 5 categories were used to identify the prevalence of functional groups. Eight functional groups were identified along the study area, with mode of reproduction (sexual/asexual) forming the base of divergence between the groups. Traits like large body size and deposit-feeding were prevalent during the Mon, while suspension feeders and carnivores increased in abundance in the PreM and PM. HMSC analysis depicted that phosphate levels support species with asexual reproductive strategies and detritivorous feeding habits, at 0.80 support value. These findings highlight the importance of trait-based ecological modelling for understanding estuarine macrobenthic assemblages in response to seasonal dynamics.

Abstract ID: 031038

REDUCED AUF-1 CONTORTS IBD PATHOLOGY BY DECREASING IL27P28MRNA HALF-LIFE AND IL-10 SURGE FROM B1A CELLS – BUTYRATE BEING THE REVERSAL AGENT IN EXPERIMENTAL MODEL AND EXPLANT CLINICAL SAMPLES

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The decline in B regulatory (B10) cells generating IL-10, has a major impact on the pathogenesis of inflammatory bowel disease (IBD) that steered us to investigate the essential genes and pathways that control the production of B10 cells. To understand the complex immunopathology of IBD, we collocated results from clinical samples as well as experimental colitis (EC) for complementarity. We showed EC displayed downregulation of RNA-binding protein, AUF1 which reduces IL-27p28mRNA stability by binding to 3'UTR of IL-27p28 mRNA that in turn decreases IL-27 mediated polarization of B1a to IL-10 secreting B1a-cells (B10-cells). This engrossing pathway was reversed on butyrate treatment. Here, AUF1 can be considered the luminary in IBD pathology as cell penetrating unique morpholino based knock-down of AUF1 in mice (AUF1-KD) developed colitis. This establishes the roster of events in splenic B1a (CD19+CD5+) cells: butyrate-AUF1-IL-27-IL-10. The colorectal biopsies of IBD-patients essentially reflected EC having decreased AUF1, IL-27, IL-10 and increased TNF-α expression compared to non IBD patient biopsies. Explants of IBD-patients in the presence of butyrate ex vivo showed enhanced AUF-1, IL-27 and B10 cells and reduced TNF-α and IFN-g expression as compared to without butyrate. Interestingly an inverse correlation was noted between clinical score and butyrate driven B10-cell expansion. To reinforce further importance of AUF-1, we showed that B10-cells derived from wild-type but not AUF1-KD mice cured experimental-colitis. This study epitomized two revelations: AUF1 wends gut homeostasis and B10 cells can be used as cell based personalized therapeutic.

Abstract ID: 053639

UNDERSTANDING THE ASSOCIATION OF PHOSPHODIESTERASE 4 AND Wnt/β CATENIN IN BREAST CANCER SUB-TYPES AND MODULATING THE SAME USING PDE4 INHIBITOR

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Resistance to chemotherapy and radiotherapy is a major challenge in breast cancer patients, causing tumor relapse in a more severe form. Variable expression of different Phosphodiesterase (PDE) isoforms in breast cancer patients has been observed previously which clearly showed increased expression of PDE4. Since blocking of PDE 4 by rolipram regressed breast cancer cells via cAMP-PKA- PI3K-Akt and Hedgehog pathway, we wanted to observe whether PDE4 expression is associated with the Wnt/β-catenin expression profile in different breast cancer sub-types. Tru-cut biopsy samples were collected, and the expression of PDE isoforms, as well as Wnt and β-catenin, were checked in 24 patients. Histopathological analysis depicted the nature of the tumors, i.e., whether they are hormone-responsive estrogen receptor (ER), progesterone receptor (PR) positive, HER2 positive, triple-positive, or triple-negative. A correlation analysis was performed to check whether the signaling cascade exploited the histological nature of the tumor. Additionally, we have examined the effects of two PDE4 inhibitors, viz., Rolipram and Roflumilast, on primary cell cultures where it was evident that rolipram plays a significant role regressing the cell proliferation and was potent in generating reactive oxygen species in the cells. From the study, it can be speculated that the cAMP-PKA-PDE4-Wnt/β catenin pathway plays an important role in breast cancer proliferation, which can be repressed by PDE 4 inhibitor like rolipram.

Abstract ID: 054633

ETHO-CHEMISTRY OF COMMUNICATION SYSTEM BY SNOW LEOPARD FOR TERRITORIAL MAINTENANCE

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Felids exhibit distinct behaviours for chemical communication including normal urination posture with ground scraping and marking fluid (MF) spraying on substratum. A distinct behavioural feature has been noticed in snow leopards [*Panther auncia* (Schreber, 1775)] where the animals rub their cheeks over the plane and spray MF instantly. Therefore, to explore the significance of epidermal structures for information transfer, hair from the cheek region of snow leopards were collected from Padmaja Naidu Himalayan Zoological Park (PNHZP), Darjeeling, West Bengal with permission for analysis. Simultaneously, MF was also collected from snow leopard, and both were analysed with the help of solid-phase-micro-extraction guided Gas Chromatography-Mass Spectrometry. A total 46 and 38 volatile compounds having different functional groups were identified from vapour state of MF and hair, respectively.

To visualize the strategy of sustenance of the chemical messages, dropped in nature by scent-marking on surroundings by this animal, different experiments were designed for simulation of this natural phenomenon. Time-frame-kinetic for release of VOCs were recorded and differential release pattern was noticed by gradual addition of synthetic lipid classes like triglyceride, cholesterol etc. The results justified that high amount of lipid and combinations of fatty acids present in hair and MF play important role as fixative of VOCs and also extend duration by preventing desiccation so that quality for coding by the senders to be meaningful for decoding by the receivers. This interpretation was also tested with *in silico* docking and with FT-IR to establish evolutionarily settled linkage that exists between animal and nature.

Abstract ID: 072747

FUNCTIONAL ASPECTS OF WINGLESS SIGNALLING IN SCULPTING *DROSOPHILA* EGGS DURING DEVELOPMENT

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A *Drosophila* egg chamber comprises of an outer epithelial layer of 600-800 follicle cells that encircles the inner core containing 16 germ cells (15 nurse cells + 1 oocyte). Each egg chamber starts their development from germarium as spherical structure. During maturation, outer follicle cells migrate collectively in a direction independent manner leading to the overall rotation of the egg chamber. The basal actin organization of follicle cells along with the basement membrane together perform molecular corset that shifts the spherical shape of the eggs to ellipsoidal. Our research unveils the role of canonical wingless (mammalian wnt) signalling in *Drosophila* egg morphology. Genetic screening of the canonical wingless pathway genes was the first step. From the ligand to receptor to the degradation complex to effector genes to the inhibitor gene that suppresses the transcription of wingless targeted genes, we targeted every part of the pathway. Our screening data unfolds the involvement of most of the wingless pathway genes along with *armadillo* (mammalian *β-catenin*) in shaping mature eggs. Depletion of ligand, receptor, destruction complex and effector genes resulted in the formation of deviated egg shape than control. Specifically a unique egg phenotype was observed by partially depleting *armadillo*. We have also observed a genetic interaction between *notch*, *delta* and *armadillo* in overall ovary development where *armadillo* depletion is somehow rescuing the effect of *notch* and *delta* knockdown. Our experimental results collectively suggest that wingless signalling may play a significant role in follicular cell migration and, in turn, egg shape.

Abstract ID: 090254

TWIST1 MEDIATED EPITHELIAL TO MESENCHYMAL TRANSITION PROMOTES DIFFERENTIATION OF EARLY CARDIOMYOCYTES FROM ACTIVATED EPICARDIAL CELLS POST INJURY, BOTH *IN-VIVO* AND *IN-VITRO*

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Millions of people are affected by heart failure every year globally. Pathophysiological studies of heart failure suggest a massive loss of functional cardiomyocytes which leads to irreversible loss of cardiac structural and functional efficiency. Our study investigated the epithelial-to-mesenchymal transition (EMT) marker Twist1, a bHLH transcription factor function in differentiating reactivated adult epicardial cells towards early cardiomyocyte lineage post injury. We have established our *in-vivo* model system using isoproterenol to induce oxidative stress in adult male rat hearts. Initial data suggests a possible hypertrophic response along with the loss of cardiomyocytes with replacement fibrosis. Increased expression of Wt1 positive cells suggests reactivation of quiescent epicardial cells in adult rat hearts upon oxidative stress injury. Elevated expression of EMT-specific Twist1 and early cardiomyocyte-specific Nkx2.5 after injury induction also indicative of EMT mediated preferential early cardiomyocyte lineage differentiation. We have also identified the possible affected molecular signaling pathway towards early cardiomyocyte lineage differentiation post oxidative stress in the heart. *In vitro* inhibitor and activator studies using epicardial cells isolated from embryonic and neonatal hearts show activation of the Bmp-Smad1/5/8 signaling towards early cardiomyocyte lineage differentiation upon induction of oxidative stress (H_2O_2 treated) and hypoxia (in hypoxic chamber) mediated injuries. Overall, this study is focused on the reparative and regenerative properties of epicardial cells of the injured heart towards generation of cardiomyocytes with better predicted cardiac structure and function.

Abstract ID: 114231

PHYSIOLOGICAL AND IMMUNOLOGICAL EFFECTS OF SHORT-TERM PARAQUAT EXPOSURE IN ADULT ZEBRAFISH

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PQ (PQ: 1,1'-dimethyl-4,4'-bipyridinium) is a widely used, fast-acting herbicide that poses significant environmental risks due to its nonselective nature. Its overuse has led to contamination of surface and groundwater, increasing the potential for human exposure. Recent studies suggest a correlation between prolonged, low-level PQ exposure and the rising incidence of Parkinsons disease in humans. Currently, there is no specific antidote or effective treatment for PQ poisoning.

This study examines the acute effects of PQ exposure on adult Zebrafish (*Danio rerio*), focusing on physiological and immunological changes. The fish were treated with PQ infused in their water for 7 days, simulating conditions similar to contaminated environments, control group being kept in only water. On the final day, the fish were sacrificed for histopathological analysis of various organs, including the gut, brain, liver, spleen, and gills, to assess structural changes. Additionally, differential cell (DC) count of blood and measurements of nitric oxide (NO) generation in the organs were conducted to evaluate immune responses.

Statistical analyses were performed to compare control and treatment groups, providing insights into the detrimental effects of PQ on fish health. Findings post sacrifice showed increased oxidative stress and immune activity along with tissue damage and loss of structural integrity in treatment group. This study can be furthered to increase chances of early diagnosis and risk assessment for vulnerable subjects of associated diseases due to PQ or similarly acting chemicals and analyse signs of disease presentation and drug design.

DECIPHERING THE RESPONSES OF MESOZOOPLANKTON COMMUNITY TO ENVIRONMENTAL VARIABILITY FROM SUNDARBANS ESTUARINE SYSTEM USING TRAIT-BASED HIERARCHICAL MODELLING

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Estuarine mesozooplankton link primary producers to higher trophic levels, driving nutrient cycling, energy flow, and ecosystem stability. This study examines the spatio-temporal dynamics of mesozooplankton of the Thakuran River, Sundarbans Estuarine System (SES). Mesozooplankton and water samples were collected across eight stations during pre-monsoon, monsoon, and post-monsoon season for a period of three years to assess shifts in community structure, functional diversity, and species-environment relationships. Copepods dominated the mesozooplankton community across all seasons and stations (SIMPER- 70-80%). Species like *Acartia spinicauda, Paracalanus purvus, Labidocera minuta* along with meroplanktonic larvae exhibited synchronous monsoonal surge reaching an average abundance of 800 indv. m^{-3} in the inner stations and 1433 indv. m^{-3} in the outer part of the estuary. Functional trait analysis identified eight functional groups among copepods, with omnivore-herbivores (*Acartia spinicauda*) dominating during monsoon, and carnivores (*Labidocera minuta, Corycaeus siusculus*) peaking post-monsoon. Ordination analyses revealed significant seasonal differences and functional clustering ($p < 0.05$) affirming trait dependent species coexistence. A Joint Species Distribution Model (JSDM) using Hierarchical Modelling of Species Communities (HMSC) was used to model the interaction between species niche and water quality parameters. The variance partitioning identified silicate, phosphate, salinity, and suspended particulate matter as the key drivers of mesozooplankton abundance explaining 95% of the variance in species occurrences. Variance partitioning result showed that *Labidocera pavo* and *Corycaeus catus* were strongly influenced by ammonia and water temperature, respectively. Our findings highlight the utility of trait-based modelling in estuarine ecology and biodiversity.

Abstract ID: 115725

MITIGATING COGNITIVE DYSFUNCTION: THERAPEUTIC POWER OF FRUIT EXTRACTS FROM GENUS *TERMINALIA* AGAINST ALUMINIUM-INDUCED NEUROTOXICITY IN ZEBRAFISH MODEL

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Recent studies suggest that aluminium (Al) water pollution is a growing environmental concern and may be linked to the prevalence of neurodegenerative disorders. Numerous plant-based materials have shown promise in alleviating neurotoxicity such as *Terminalia* genus (Combretaceae family) which includes approximately 200-250 species primarily found in tropical and subtropical regions. Traditional texts extensively describe the ethnopharmacological uses of beleric myrobalan (*Terminalia bellirica*) and Indian almond (*Terminalia catappa*) fruit extracts. Zebrafish (*Danio rerio*) are an excellent model for toxicological research and were used in this study. Therefore, we aimed to investigate the potential of *T. bellirica* and *T. catappa* fruit extracts to counteract aluminium-induced neurotoxicity in a zebrafish model. Wild adult zebrafish were divided into 3 groups: Group A-Control (normal diet), Group B-Al treated (9.97 mg/L of $AlCl_3$ in water and normal diet), Group C & D-Al treated with simultaneous plant supplemented diet (0.8g/Kg concentration of *T. bellirica* aqueous extract and 0.8g/Kg concentration of *T. catappa* ethanol extract respectively). The biochemical markers of brain (GFAP, AChE and MAO), oxidative stress biomarkers from brain (SOD activity, CAT activity, MDA level, GSH level, and cellular ROS assay), metal analysis parameters (concentrations of metal in brain, bioconcentation factor) and histopathological study of brain were assessed after 28 days of exposure. Overall, our findings demonstrate that Beleric myrobalan and Indian almond has neuroprotective efficacy against aluminium-induced model in zebrafish.

A NOVEL FRFT-BASED APPROACH FOR SILKWORM COCOON QUALITY ASSESSMENT

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The silkworm, scientifically known as *Bombyx mori*, is a domesticated insect with economic and cultural importance due to its role in the production of silk. These remarkable lepidopterans have been cultivated for thousands of years for their ability to spin fine silk threads. It has been a cornerstone of the textile industry and a socioeconomic framework throughout history in all countries. Silkworm cocoon quality, a key determinant in silk production, is traditionally evaluated through subjective methods. This research presents a novel approach that employs entropy and fractional Fourier transform (FrFT) for a more quantitative and objective assessment. Scanning electron microscopy (SEM) images of silkworm cocoons were analyzed to assess the impact of pesticides on cocoon structure. Entropy, a measure of disorder, is usually used to quantify irregularities in the woven patterns, indicative of pesticide-induced stress. FrFT, a signal processing technique, was employed to detect periodic components and noise within the cocoon images. Our findings demonstrate that the use of FrFT effectively discriminates subtle variations in cocoon images, even when imperceptible to human observation. This novel approach provides a sensitive and reliable method for quantifying silkworm cocoon quality. The proposed methodology has potential applications in silk industry quality control, pest management, and broader image analysis tasks involving irregularity detection and classification.

PESTICIDE RESISTANCE MECHANISMS IN TEA MOSQUITO BUG (*HELOPELTIS THEIVORA*): INSIGHTS FROM GENETIC AND BIOCHEMICAL STUDIES

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Helopeltis theivora, commonly known as the tea mosquito bug, poses a significant threat to tea plantations by sucking sap from shoots and leaves, leading to reduced yields. The tea industry heavily relies on chemical insecticides for pest control; however, frequent application has resulted in the development of insecticide resistance in *H. theivora*. Resistance has been observed against several previously effective pesticides, including deltamethrin, quinalphos, and endosulfan. This study aimed to distinguish phenotypic variations between resistant and susceptible populations of *H. theivora* collected from tea-growing regions in West Bengal and Assam. Insecticide bioassays were conducted to identify these populations, and biochemical assays were performed to investigate the role of detoxification enzymes—specifically cytochrome P450 monooxygenases, glutathione S transferases, and general esterases—in resistance mechanisms. Phylogenetic analysis utilizing ISSR markers was carried out to assess genetic differences between resistant and susceptible insect groups. Additionally, SNP genotyping identified high and moderate-impact allelic variations that contribute to insecticide tolerance. This research aims to develop pesticide-specific resistance markers. Such identification will aid in refining chemical control strategies, promoting environmentally sustainable practices in tea cultivation, and supporting the broader tea economy.

Abstract ID: 092412

INSECTICIDE RESISTANCE AMONG *AEDES ALBOPICTUS* POPULATIONS FROM SOUTHERN WEST BENGAL, INDIA-: IMPLICATIONS FOR CONTROL OF DENGUE.

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The Asian tiger mosquito (*Aedes albopictus*), native to Southeast Asia, is a major public health concern in rural West Bengal due to its role in spreading arboviral diseases like Dengue, Chikungunya etc. Though exophilic but due to their proximity to human habitation, these mosquitoes are frequently exposed to several pyrethroid pesticides. This prolonged exposure leads to development of resistance in the mosquitoes.

Aedes albopictus mosquitoes from various locations in ( ) West Bengal were subjected to insecticide susceptibility test against pyrethroid insecticides, adhering to WHO-CDC protocol. Resistant mosquitoes were analyzed for Knock down resistance (kdr) mutations in the Voltage Gated Sodium Channel (VGNaC) gene through PCRs targetting segment 6 of the three domains of the gene -Domain II, III, and IV known for conferring resistance through target site insensitivity.

Varying levels of resistance against pyrethroid insecticide- Deltamethrin and Permethrin, were found amongst the regional mosquito populations. The amplicon sequence data of VGNaC Domain II, reveals presence of several mutations at amino acid position 990, 1016, 1017, 1018 and 1020. Domain III shows presence of mutation at position 1509, 1510, 1520 and 1534 mutations. No alteration in sequence was detected in the Domain IV. The flanking introns in domain II and III shows high degree of polymorphism. Both synonymous and non-synonymous mutations were detected in each domain. Some novel mutations were also found. Further research is required to understand the impact of these novel mutations on resistance.

This study will aid in designing and implementation of effective vector control strategy, in dengue prone areas and will also help to minimize the environmental pesticide load.

Abstract ID: 114852

MICROBIAL COMMUNITY OF SOME SELECTED FRESH WATER BODIES OF GANGETIC PLAINS OF WEST BENGAL.

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Recent advancement of sequencing technology and computational tools have enabled the detailed study of microbial community in freshwater bodies. The objective of this study was to assess the microbial communities of different freshwater bodies.

In the current study, microbial communities of three freshwater bodies of varying locality (Urban, Rural and Suburban), management practices and utility purposes, located in and around Kolkata, West Bengal, were identified using Shotgun metagenomic technique during monsoon season.

Shotgun metagenomics shows that 27279 microbial species belonging to 4494 genera were found in urban freshwater, 17250 microbial species belonging to 3790 genera were found in rural freshwater whereas 27025 microbial species belonging to 4269 genera were found in suburban freshwater bodies.

The Shannon ,Simpson and Fisher - diversity indices were higher in urban , moderate in suburban whereas lower in rural freshwater bodies.

In the urban bodies *Aeromonas* sp., *Lactococcus* sp., *Acinetobacter* sp. are most abundant microbes. In the suburban bodies *Exiguobacterium* sp., *Acinetobacter* sp., *Enterococcus* sp. are most abundant microbes. In rural bodies *Aeromonas* sp., *Acinetobacter* sp., *Lactococcus* sp. are most abundant microbes .

Some of the medically important microbes such as *Aeromonas* sp., *Lactococcus*sp., *Aspergillus* sp., *Acinetobacter*sp.,*Vibrio* sp., *Salmonella* sp. etc. were also found in the water bodies that may have serious health implications amongst the local people.

This study provides initial insights into the freshwater microbial community in the region under varying levels of human activity. The findings will aid in suggesting effective management practices for the conservation of freshwater bodies.

Abstract ID: 115607

STUDY ON VARIATIONS OF SOME MORPHOGENETIC CHARACTERS FROM HUMAN POPULATION IN AND AROUND KOLKATA AND SUB-URBAN AREAS

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Morphogenetic traits are inherited from parents to their offspring. It is well known that population surveys are crucial for figuring out how prevalent a particular trait is. In nature, there are many morphogenetic traits; among them, three popular characteristic traits for e.g. Tongue rolling, Cheek dimples, and Widow's peak were chosen for the study. Over 100 individuals were observed for the survey of different parts of North 24 Parganas and Kolkata. Analysis was performed to assess how many variations of each trait were present in the sample population. Data were examined to look for variations or any significant correlations between blood groups, castes, sub-castes etc. To determine whether the characteristics are in Hardy-Weinberg equilibrium, the sample's genotype and gene frequencies were also calculated. It has been found that Tongue rolling is a more common event in the population than Widow's peak and Cheek dimple. Most tongue rollers are from the Nama Sudra and Brahmin (71.43%). Cheek dimples are more common in women than men, and mostly in Brahmins (57.14%). Widow's peak characters are not common in the population. Though the sample size was small, the prevalence and expressivity of those traits in the studied population are moderately descriptive.

ENGINEERING SCIENCE AND TECHNOLOGY

Abstract ID: 024352

STUDY OF PARTICLE DISTRIBUTION EFFECT ON ELECTRO-ELASTIC PROPERTIES FOR A CASTOR OIL DERIVED POLYURETHANE/$BATiO_3$/ MWCNTS THREE-PHASE ENERGY HARVESTING PIEZOELECTRIC SMART COATINGS: FINITE ELEMENT ANALYSIS-BASED PREDICTION AND EXPERIMENTAL VALIDATION

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Castor-oil-derived polyurethane (CPU)/barium titanate (BT)/multi-walled carbon nanotubes (MWCNTs) based three-phase smart coating films were synthesized with BT content in the range of 0.03 to 0.25 volume fraction (v_f), having 0.0037 v_f of MWCNTs. The open-circuit voltage (V_{OC}) and short-circuit current (I_{SC}) output were evaluated for an applied dynamic load of 25 N at variable impact frequencies (0.5, 1, 2, and 5 Hz) equivalent to human walking to running frequency range. MWCNTs is observed to enhance the output I_{SC} and V_{OC} to a value of ~27.7 nA and ~6.5 V for CPU/CNT having 0.25 v_f BT, at 5.0 Hz impact frequency an increase of 1.22 and 1.28 times respectively, compared to two-phase CPU/BT-0.25.The piezoelectric strain coefficient (d_{33}), relative dielectric constant (k/k_0), and elastic modulus obtained from the experiment closely match with the results obtained from finite element analyses (FEA) based prediction methodology. FEA prediction was employed based on kinematic uniform boundary conditions (KUBC), effectively studied for four variable representative volume element (RVE) models for every input BT filler volume fraction (having four different particle distributions within the matrix phase). The predicted average d_{33} value for CPUBT/CNT composite having maximum BT content was obtained to be of ~ 2.2 ± 0.04 pC/N, a close match to the experimental d_{33} value (1.8 ± 0.1 pC/N).The energy-harvesting coatings can be used to generate electrical energy from mechanical loadings (human and vehicular movement), and can also be applied on vertical geometries that undergo regular stress-strain-related deformation, for structural health monitoring.

FABRICATION OF BIO-INSPIRED MEMBRANE INCORPORATED WITH MICROBIAL MEMBRANE TRANSPORT PROTEIN FOR WATER TREATMENT.

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The rapid industrialization is marked with water scarcity globally. The demands of sustainable water treatment approaches have paved way towards advancement in membrane technology. The osmotic pressure driven, bio-inspired membrane has gained interest as an alternative filtration mechanism. This study explores the fabrication of bio-inspired membrane integrated with microbial integral membrane proteins, specifically aquaporin (Aqp) for its elevated water transport efficiency and maintain the solute rejection. These advanced ultra-permeable membranes have emerged as promising technology in terms of water transport. Aquaporins, which expedites high-flux water passage in microbial cell membranes while occluding ions and other impurities, are embedded within a synthetic polymer matrix to mimic natural filtration mechanisms. The microbial integral proteins aquaporin Z was isolated from Escherichia Coli and the protein was expressed via recombinant DNA technology. The reconstitution of the protein was done within synthetic unilamellar vesicles through rehydration-extrusion method. Modified interfacial polymerization was adopted to immobilize aquaporin reconstituted vesicles onto porous membrane matrix creating a synthetic biomimetic membrane. The size and stability of the vesicles and aquaporin embedded vesicles was characterized using dynamic light scattering and Zeta potential. The fabricated membrane was characterized for surface morphology using scanning electron microscope. The water treatment experiments were carried out using an in-house dead end filtration unit. This study highlights the promise of biomimetic engineering in addressing global water purification challenges through innovative, sustainable filtration technologies.

Abstract ID: 082604

ENHANCED PERFORMANCE OF LIGHT-INDUCED, SELF-CHARGING PIEZOELECTRIC SUPERCAPACITOR: ONE-STEP SOLUTION FOR ENERGY HARVESTING AND STORAGE

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Sustainable energy is no longer optional; it is vital for meeting global energy demands while addressing environmental challenges like pollution and the depletion of fossil fuels. Renewable sources such as wind, tidal, and geothermal energy are crucial for large power grids, but smaller, low-power devices like sensors, IoT systems, and wearable technology require alternative solutions. Piezoelectric energy harvesting is an effective option for powering these low-power, portable, and flexible devices. By integrating energy harvesting and storage into a single, self-charging unit, the need for external batteries can be eliminated, ensuring continuous power supply.

Among the promising materials for these systems is polyvinylidenedifluoride (PVDF), a cost-effective and flexible ferroelectric polymer. However, its efficiency is limited by the presence of the non-polar α phase, while the polar β phase is responsible for its desirable ferroelectric properties. To enhance the β phase, researchers use external fillers like methylammonium bismuth iodide ((CH3NH3)Bi2I9), an optically active organic-inorganic hybrid perovskite. Through electrospinning, this filler is integrated into the PVDF matrix, forming nanofibers with significantly increased β phase content, resulting in 91% ferroelectric phase and 86% crystallinity.

This hybridized material not only enhances piezoelectric energy harvesting but also functions as a light-induced, self-charging piezoelectric supercapacitor, making it highly useful for nano-tactile sensors and energy storage devices under dynamic conditions.

PREDICTIVE ENERGY MANAGEMENT IN MICROGRIDS: DAYLIGHT AND OCCUPANCY SENSORS WITH LIFE CYCLE COST ANALYSIS

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This paper presents an advanced energy planning framework for microgrids, focusing on optimizing residential energy management through renewable energy availability and smart sensor integration. The system incorporates daylight and occupancy sensors to monitor real-time household energy consumption, aiming to reduce wastage and enhance energy efficiency. Renewable sources such as solar and wind are the primary contributors to the microgrid, while an energy storage system (ESS) is used to store excess energy for future use, ensuring the stability of energy supply during low-generation periods. A core feature of this approach is the prediction of energy consumption based on real-time data from daylight and occupancy sensors. This allows for more accurate demand-response strategies that align energy use with availability, maximizing the utilization of renewables. Additionally, a life cycle cost analysis of both the sensors and the ESS is performed, evaluating the long-term economic benefits of the system, and assessing its financial feasibility over time. By integrating these smart technologies, the system not only improves energy efficiency but also reduces reliance on conventional energy sources, lowering operational costs and enhancing sustainability. The results demonstrate significant energy savings and cost reduction, proving the efficacy of combining smart sensors, energy storage, and renewable energy for residential energy management in microgrids. This work contributes to the development of sustainable and cost-effective energy solutions, offering a scalable approach for future microgrid implementations.

Abstract ID: 111324

A MULTI-FACETED WEB-BASED AI TOOL FOR CHEST X-RAY IMAGING TO SUPPORT PUBLIC HEALTH

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In the interest of public health enhancement, we have developed an integrated web application that offers a comprehensive suite of image classification, segmentation, and segmentation-based classification tools for lung X-ray image analysis. The application is designed to aid in the early detection and preliminary assessment of lung health conditions, specifically targeting normal lung states, COVID-19, viral pneumonia, and bacterial pneumonia. By providing a unified platform that combines multiple analytical methods, this tool facilitates deeper insights and improved diagnostic accuracy.

To power this tool, advanced deep learning techniques, including Convolutional Neural Networks (CNNs) and Vision Transformers (ViTs), the tool can accurately classify and segment chest X-ray images, identifying subtle patterns for condition differentiation. Developed on the Django web framework, it ensures a secure, scalable, and user-friendly experience, integrating seamlessly with image processing machine learning models, users can experience smooth and reliable access to advanced diagnostic tools. The application includes image processing features such as zooming, brightness and contrast adjustments, flipping, and inverting images to enhance user analysis. These tools support detailed inspections, facilitating informed health assessments.

This web-based solution enables remote lung health evaluation, particularly beneficial for individuals without immediate access to medical facilities. It supports medical practitioners, researchers, and the public in diagnosing common respiratory conditions, assisting in visualization and interpretation for early intervention and treatment planning. This technology is particularly significant for public health in West Bengal and surrounding regions, contributing to timely and accurate lung health management and reducing the strain on healthcare resources.

Abstract ID: 074029

DESIGN AND DEVELOPMENT OF A COST-EFFECTIVE ENVIRONMENTAL FRIENDLY PORTABLE AUTOMATED DISINFECTION BIN FOR DOMESTIC AND HEALTHCARE USE

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There is a momentous increase in contagious diseases worldwide- a trend that the COVID-19 pandemic has exacerbated. In the post–COVID era, the rise in respiratory infections worldwide along with several health hazards mostly to elderly and COVID-infected patients required urgent need of portable devices that can prevent the spread of pathogens from sick person's items such as gloves, cotton, bandages, syringe, etc. Currently, there are sterilizing devices which are available in the open market; however, many of these are either prohibitively expensive or not user-friendly, making them cumbersome to operate. In response to this issue, we propose to develop a compact disinfection closed bin with UV lamps along with automated features that ease the operation procedures. This bin will incorporate a propelling mechanism to ensure efficient exposure of waste to ultraviolet light contained within the unit. Its design will facilitate easy installation, operation, and portability, thereby conserving space and making it easy to use even for elderly people. The proposed device will feature automated opening and closing mechanisms, which will minimize the risk of cross-contamination during the transfer of infected materials. This approach is expected to significantly reduce the microbial load associated with such waste and mitigate its potential spread into the environment.While the initial prototype has been designed with a focus on hospital and domestic waste, such as gloves, masks, and other plastic-based materials, it can be readily adapted for the disinfection of a variety of medical and domestic waste types.¨

ANTIOXIDANT SMART HYDROGELS FOR ACTIVE FOOD PACKAGING APPLICATIONS

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This scientific study focused on developing binary hydrogels by incorporating tomato powder into gelatin matrices, using crosslinking and casting techniques. The incorporation of tomato powder aimed to enhance the hydrogels' antioxidant and antimicrobial properties. Hydrogel characterization was assessed in terms of solubility, swelling ratio, and moisture barrier properties, alongside the surface morphology of the binary hydrogel was observed through scanning electron microscopy. The incorporation of tomato exploited the smart nature of the hydrogel which could be explored extensively in active food packaging applications.

The binary hydrogel demonstrated very good surface morphology with uniform surface thus corroborating with the low solubility, swelling ratio and moisture barrier properties making it suitable for active food packaging applications. Further, the findings indicated that the addition of tomato powder significantly improved the hydrogels' antioxidant and antimicrobial activities.

These enhanced characteristics position the developed hydrogels as promising candidates for food packaging applications, providing effective preservation and protection benefits. Overall, this work highlights the potential of bioactive materials in creating functional packaging solutions.

Abstract ID: 105918

STUDY ON DIELECTRIC RELAXATION BEHAVIOUR OF SOME AgI DOPED GLASS NANO-COMPOSITES

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The dielectric characteristics of a certain AgI-doped glassy system, having composition x AgI – (1- x) (0.1 CdO – 0.3 V_2O_5 – 0.4 P_2O_5 – 0.2 ZnO) with x = 0, 0.05, 0.1, 0.2, 0.3, 0.4 have been investigated using electric modulus formalism. The experimental outcomes have been examined in the context of a few theoretical models and that has revealed the system's transition from debye type to non-debye type of relaxation with the augmentation of AgI content. The study has focused on the peak separation between imaginary components of electric modulus and complex impedance spectra of the samples at any distinct temperature. The current system, with a reduced AgI concentration (upto x = 0.2), have a tendency to show long range order for the relaxation of charge carriers, as both the M2 and Z3 spectra overlap, whereas, the system with a greater AgI content, have separated peak positions on the M2 and Z3 spectra which shows a relaxation process, dominated by charge carriers with a short range order. It can be anticipated that the polarons act as main charge carriers in the system with lower AgI content and thus it will hop between the localized states. This further suggests that the system with a greater oxide content develops a vacancy defect (trap centre), exhibiting debye type of relaxation.Conversely, the system with larger AgI and lower oxide content, is primarily responsible for generating a substantial number of vacancy defects and thus exhibits non-debye type of relaxation.

PREDICTION OF EFFECTIVENESS OF DRUGS USED IN CANCER TREATMENT WITH THE AID OF MACHINE LEARNING

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According to the National Cancer Registry Programme, the number of patients with cancer reported in India in the year 2020 was 1,392,179. Machine learning (ML) techniques play an important role in predicting cancer drug effectiveness based on parameters such as cancer cell lines, cancer subtypes, IC50 of drugs, Z score, dosage. In the present work, three case studies are reported to establish the effects of machine learning on cancer treatment. In one of the studies, support vector machine (SVM) technique with linear, polynomial and radial kernel functions have been employed to predict the IC50 values of FDA approved drugs, namely, erlotinib, rapamycin, paclitaxel and sunitinib in different cancer cell lines based on dataset acquired from the Cancer Cell Line Encyclopedia (CCLE). A lower value of IC50 implies that the drug is effective at lower concentration and causes less toxicity to patients. The IC50 values were predicted based on the Z score and area under the dose-response curve (AUC). It was observed that for erlotinib, SVM with radial kernel function predicted with the lowest value of mean square error (MSE), 31.17. In another study, efficacies of FDA-approved drugs were predicted with high accuracy (>95%) using logistic regression based on the survival data of patients. Lastly, ML algorithms were used to systematically forecast synergistic drug combinations based on the differences in potency and efficacy between the drug combinations and the individual drugs. Predicted results were found to be in good agreement with clinical trial data on breast cancer.

Keywords: Support vector machine; IC50; synergy; potency and efficacy; drug combinations

SUSTAINABLE FEDERATED LEARNING FOR EMERGENCY SERVICES USING INTERNET OF DRONES

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Sustainability is liable to fulfil the requirements of present generations by ensuring a balance among environmental care, economic growth, and social well-being without compromising the requirements of the future generations. Embracing environmentally sustainable practices assists mitigate climate change, minimize pollution, and enhance a healthier planet. For this reason, measuring climate parameters and different pollution indices like water pollution index, air pollution index, and sound pollution index etc. from time to time highly impacts the balance of the eco systems. Internet of Drones or Internet of Drone Things (IoDT) can collect climate data from large coverage areas and integrate for future predictions. To preserve privacy, nowadays Federated Learning (FL) has been widely used to train local datasets in a decentralized way. It is an emerging distributed Machine Learning (ML) technique which allows clients to train their data locally on the edge devices and only share updated model parameters with the server. Integrating IoDT with decentralized privacy preserving FL framework, our proposed decision-making methodology finds the environmentally sustainable energy-efficient path for emergency drone services. We have used time series based bidirectional Long Short-Term Memory (LSTM) for FL framework in a multi-drone environment.

STRUCTURAL HEALTH MONITORING OF BRIDGES BASED ON CHANGES IN MODAL DERIVATIVES

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Bridges are one of the most important part of the transportation infrastructure. Hence, Structural Health Monitoring (SHM) of bridges is significantly important from safety, reliability, timely repair and durability considerations. Non Destructive Tests (NDTs) & Static Load Test are prescribed in Indian Standard for acceptance criteria of bridges; and are extensively practiced. However, identification of damage including its location & severity has not been precisely addressed having the limitations of location dependency. Thus, dynamic response i.e., modal parameters and their derivatives seems to be an alternative and better proposition for SHM; as these reflect the physical properties like mass, stiffness, and damping of a structure, which change with adverse changes in these properties. The current research aims to evaluate and compare the modal parameters of numerical models representing various damage conditions with those of undamaged bridge structures. Structural components of various types of bridges are modelled and analysed using Finite Element Method to obtain key modal parameters, including frequencies, mode shapes & their derivatives, and modal damping. A significant effect of structural damage on these modal parameters is observed, and, thus, seems to be a crucial tool for global damage detection of bridges in real-life scenarios using their vibration characteristics. Experimental study of modal parameters extraction through OMA adopting Ambient Vibration Technique has also been attempted for practical implementation.

AI BASED COMPARISON OF AFPMSM FOR DIFFERENT POLE CONFIGURATION SUITABLE IN EV APPLICATION

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Researchers have been planning and structuring new drive systems associated with Electric Vehicle (EV) in order to mandate for clean energy. Electric motor, being the heart of the drive system, embraces the performance and life of the EV. The Permanent Magnet Synchronous Motor (PMSM) has excessive use likely in the present field of pure EV. In this paper, the performances of two different types of PMSM, has been analyzed on the basis of their various designed parameters. The two motors are Axial Flux Permanent Magnet Synchronous Motor (AFPMSM) and Line Start Permanent Magnet Synchronous Motor (LSPMSM). A comparative study has been conducted in this work for obtaining the best possible option for EV application. The analysis has been performed in Ansys EDTA environment under steady-state condition. A number of AFPMSM has been considered here with different pole numbers for the analysis. Various characteristics like speed, torque, current, output power, efficiency etc. has been observed from the result.

SAURYA RADHUNI- A SOLAR-POWERED SOLUTION FOR SUSTAINABLE COOKING AND LIGHTING IN RURAL HOUSEHOLDS

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In rural communities, particularly in the Sundarbans region of West Bengal, India, traditional cooking methods create significant environmental and socio-economic challenges. The "SauryaRadhuni" project offers an innovative solution through an integrated solar-powered forced-draft cookstove and hybrid solar lighting device. The core component, a solar-powered forced-draft cookstove, is designed to reduce smoke emissions significantly, enhancing users' health and safety. Utilizing an induced draft method and an adjustable RPM control blower fan, the cookstove optimizes cooking efficiency while consuming minimal power, improving indoor air quality and transforming the cooking experience for up to eight individuals. Complementing the cookstove is a hybrid solar lighting device, adapted from the Micro Solar Dome into a 12V variant. This device harnesses natural sunlight during the day for up to eight hours of illumination and seamlessly transitions to a 4W LED system at night, providing up to fifteen hours of reliable lighting. This solution eliminates the need for kerosene lamps, fostering a cleaner environment. To power these innovations, a comprehensive controller with a built-in MPPT controller has been developed, charged by a 20Wp Polycrystalline Solar module and equipped with a 7Ah battery. The SauryaRadhuni system represents a multifaceted approach to sustainable rural development, minimizing carbon emissions while empowering communities through improved health, time savings, and resource efficiency. This scalable, adaptable system paves the way for a cleaner, healthier, and more sustainable future for economically disadvantaged communities.

DEW ENABLED UAV BASED PRECISION AGRICULTURE FOR CROP MONITORING & MANAGEMENT

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The agricultural sector is shifting towards cutting-edge technologies to meet the difficulties of rising global food demand, resource scarcity, and environmental sustainability. As a game-changing solution, precision agriculture uses technological breakthroughs to improve farming methods and increase sustainability. This paper proposes UAV-based intelligent precision agriculture, a novel framework that combines machine learning, image processing, and the Internet of Things (IoT) for sensing and performing crop recommendations. Dew nodes are embedded with sensors to measure soil temperature, pH, nitrogen, phosphorus, potassium (NPK), and moisture levels. Data is assembled from dew nodes by UAV fitted with Raspberry Pi units, which allow data to be transmitted wirelessly to an IoT platform without constant internet connectivity. Based on soil and ecological information, ensemble machine learning models predict the best crop varieties with 98.82% accuracy. The system automates irrigation based on real-time soil moisture readings, ensuring optimal water usage, which improves farming and solves the agricultural system's water crisis by minimising water waste.

Additionally, a YOLO v9 model allows for the real-time detection of pests, weeds, and plant diseases from crop photos captured by dew node cameras, allowing for early intervention. The proposed paper enriches decision-making with valuable insights, encourages sustainable farming practices, and improves resource efficiency. Experimental results demonstrate the value of the proposed research, with 95.10% accuracy in detecting plant diseases, 99.4% in detecting pests, and 86.8% in detecting weeds. As a result, farmers are given access to adaptive management techniques, agricultural output rises, and environmental impact is reduced.

STUDYING EVOLUTION OF HUMAN SETTLEMENTS IN AND AROUND SACRED PRECINCTS: ESTABLISHING RELEVANCE OF RESEARCH WORK

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Human Settlements are places where people establish communities to live, work, and interact. They may vary in size, from small villages to large cities, and can be permanent or temporary. These settlements are typically organized based on the availability of resources like water, fertile land, and trade routes. Sacred Precincts are major accentuations of evolution of human settlements, which generate activities and attract huge population, as well as, trigger changes in the characteristic patterns of these settlements, with due course of time.

In developing areas, like West Bengal, these settlements which have come up in and around these sacred precincts, have failed to follow desired direction of growth, leading to drastic changes in overall spatial and physical environment.

This requires contiguous intervention, to apprehend further deterioration of these areas and to rectify the same to a considerable extent. In this perspective, the said research work would be undertaken and the attempt would be made to formulate a framework for organized settlements around the sacred precincts, in a structured and sequential manner.

Abstract

DEVELOPMENT OF SUSTAINABLE COMPOSITE HYDROGEL AS ADVANCED WOUND DRESSING FOR TOPICAL DRUG DELIVERY APPLICATION

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Hydrogels are cost effective and promising material that have three dimensional polymeric structure and the ability to mimic extracellular matrix (ECM) promoting tissue regeneration and cell proliferation providing an ideal environment for wound healing. Hydrogels are improved therapeutic tool as it can encapsulate drug of interest in the polymeric network which can be delivered at the site of injury in a controlled manner facilitating rapid and steady healing preventing the wound site from pathogenic invasion. Furthermore, hydrogels are environment friendly compared to traditional dressing material as they are biodegradable and recyclable. Thus, the present research focuses on development of sustainable composite hydrogel by natural polysaccharide chitosan prepared by freeze thawing method. Gentamicin and active components of citrus fruit peel extract was encapsulated during the preparation. The synergistic effect of the gel was studied and it was found that the combination of citrus fruit and gentamicin showed better result than hydrogel encapsulated with only antibiotic. Drug release profile showed a controlled release pattern at pH 7. The hydrogel matrix also showed a promising antibacterial property. Hence the matrix can be a promising wound dressing biomaterial for topical application.

THERMOCAPILLARY EFFECT ON COMPOUND DROPLET INSIDE Y-SHAPED MICROCHANNEL

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The thermocapillary effect on compound droplets within Y-shaped microchannels under pressure-driven flow is of critical importance in microfluidic applications. This study investigates the dynamics of compound droplets, consisting of an inner droplet encapsulated by an outer droplet, as they navigate bifurcating Y-shaped microchannels. Thermocapillary forces, generated by temperature gradients along the droplet interface, induce Marangoni flows that significantly influence droplet deformation, migration, and breakup. Using numerical simulations, we investigate the interplay between pressure-driven flow and thermocapillary forces, demonstrating that temperature gradients can substantially alter droplet trajectory and shape. The imposed temperature gradient (For the range of 0°C to 10°C) across the channel walls creates a surface tension gradient, driving Marangoni flows that propel the droplets. In the creeping flow regime ($Re \approx 0$), viscous forces dominate, while the small capillary number (Ca in the range of 0.05 to 0.5) ensures that surface tension controls droplet deformation. The microchannel confinement and boundary conditions significantly affect both the flow and thermal fields, reinforcing the temperature gradient and Marangoni flows. Our findings suggest that thermocapillary control offers promising potential for enhancing droplet sorting, mixing, and targeted delivery in microfluidic systems, with applications in biomedical and chemical fields. This work explores the complex dynamics of compound droplets under the combined influence of temperature gradients and Poiseuille flow, contributing to the optimization of microfluidic device performance.

FLEXY MOTION: AN AUTOMATIC EXOSKELETON SYSTEM

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Paralysis of the lower extremities severely limits mobility, making daily tasks like standing, walking, and transitioning between sitting and standing difficult. This can lead to muscle atrophy, poor circulation, and other health issues. Current rehabilitation methods often require significant manual assistance, creating a need for advanced, autonomous assistive devices. The proposed automatic exoskeleton system offers a solution, designed specifically for paralysis patients with a sitting arrangement.

This lightweight, durable exoskeleton—made from materials like aluminium alloy or carbon fibre—provides mechanical support for walking, standing, and smooth transitions. Powered by efficient brushless stepper and servo motors, the system features advanced sensors such as IMUs, pressure, and load sensors that monitor posture, weight distribution, and movement. These sensors feed real-time data to a microcontroller, which adjusts the system for balance and safety.

A key feature is its ability to assist users in standing and sitting, reducing the need for caregiver help and minimizing injury risk. Powered by long-lasting lithium-ion batteries, the exoskeleton allows for hours of continuous use. Its intuitive interface includes a handheld controller and optional voice commands for easy operation.

Safety is ensured through fall detection sensors and an emergency stop function. With its focus on affordability, ease of use, and safety, this exoskeleton aims to restore mobility and independence for paralysis patients, significantly improving their quality of life.

WINDRONE: ANALYSIS OF WIND SHEAR EFFECTS ON GLOWWORM SWARM OPTIMIZATION-BASED INTERNET OF DRONE THINGS IN VARIOUS TERRAIN

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In recent times, drones are considered as one of the key IoT devices in emergency services such as disaster, healthcare, rescue, surveillance, and various welfare applications. But, the wind disturbances extremely affect stable and optimized drone operations in emergency. Prediction and optimization of wind fields using statistical atmospheric models are used to characterize the real-time wind field for flying vehicles. Various statistical models of the wind, which have significant influence on Internet of Drone Things (IoDT), can be applied in windy environments, including wind shear, wind gust, turbulent wind, and the horizontal wind. In our work, we have analysed the wind shear effects, which is the variation of wind speed with altitude and it affects the flying vehicles to reach their destination. We have proposed a novel wind-mitigated framework on Glowworm Swarm Optimization (GSO)-based drone path in various terrains i.e., from cities with tall buildings to open calm sea. GSO is a metaheuristic intelligent technique inspired by the glowing nature of the glowworms. We have employed GSO to optimize drone paths by mitigating wind shear effects to reach its intended destination. Our proposed model WinDrone evaluates and analyses the mean wind speed for a range of altitude and finds an optimized path for the flying vehicles in emergency.

A STUDY ON NON-INVASIVE APPROACH TO DIABETES DETECTION USING QUARTZ CRYSTAL MICROBALANCE (QCM) SENSORS FOR BREATH ANALYSIS

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Diabetes has become a prevalent health concern worldwide, affecting not only the elderly but also a growing number of young individuals. Currently, the primary method for detecting diabetes is through blood tests, which can be time-consuming and invasive. This paper introduces a novel approach for non-invasive diabetes detection by monitoring the percentage of specific gases, particularly acetone, in human breath using a Quartz Crystal Microbalance (QCM) sensor-based system. Medical research has established a correlation between elevated levels of acetone in the breath and an increased risk of diabetes. The proposed set-up consists of an air-sealed container equipped with QCM sensors to observe changes in natural frequency. After depressurizing the container, pure gases such as acetone, ethanol, and oxygen are introduced into the vacuum chamber. The QCM sensors detect frequency variations as these gases interact with the system, providing real-time data. The results show distinct frequency shifts with each gas. These findings are analysed to illustrate the sensor's sensitivity to gas concentrations. This study highlights the potential of the QCM sensor system to advance diabetes detection, offering a quicker, non-invasive alternative to blood testing. The research combines descriptive, and experimental methods to demonstrate the efficacy of this approach, which could significantly benefit medical pathology and diabetes management.

Abstract ID: 115516

APPROACH TO DESIGN SMART T-SHIRT FOR HEALTH MONITORING

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This smart T-shirt is the amalgamation of advanced wearable technologies that monitor healthy body metrics. The sensor capabilities in this T-shirt further increase with embedded features like heart rate monitors, body temperature sensors, posture correction sensors, and breathing monitors at strategic points on the chest, underarm, back, and shoulder for accurate data collection. Owing to the ultra-slim and foldable shape, these sensors are placed within the fabric in an invisible and nonintrusive form. Polyester blend in the T-shirt guarantees that these sensors fit very tightly concerning flexibility and comfort. Also, cleaning the detachable modules of the sensor is quite easy, and hence, the life of the product can be prolonged. Through IoT, all this information captured by sensors is wirelessly sent to an application on a smartphone. This will be provided with real-time health and fitness values. It makes Smart T-shirt very useful for all fitness enthusiasts, athletes, and the ones who can really be quite keen on tracking their health. Further, regarding pricing, it is affordable, along with features such as sweat monitoring that can be marketable in India. Since health-related wearable devices are on huge demand, this smart T-shirt would be a product seeking proper market space both in the domestic as well as foreign markets as competitive offering.

Abstract ID : 102654

MACHINE LEARNING TECHNIQUES FOR PREDICTION OF HEART DISEASE

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Heart disease, which is another name for cardiovascular disorder, is used to describe several disorders affecting the heart and blood arteries. There is an urgent need for reliable and practical approaches that can identify individuals at risk and facilitate prompt treatment. Data mining is a powerful tool for extracting valuable insights from large healthcare datasets. By employing sophisticated algorithms and statistical techniques, data mining can identify hidden patterns, trends, and relationships that may be indicative of health conditions, disease progression, or treatment effectiveness. By employing advanced data mining and machine learning techniques, researchers analyze complex medical data. This analysis enables healthcare professionals to make more accurate predictions about the risk of heart disease. This research paper explores several factors associated with heart disease and develops predictive models using supervised learning techniques such as Naïve Bayes, K-nearest neighbors, decision trees, and random forests. This paper utilizes a publicly available dataset of heart disease patients sourced from the UCI Machine Learning Repository. Machine learning models for the prediction of heart disease can be trained and evaluated using this dataset, which is a well-known resource in the data science field. The goal of this study is to predict the likelihood of developing heart disease in patients. The findings of the study indicate that the K-nearest neighbor (KNN) algorithm outperformed the other machine learning models evaluated, achieving the highest accuracy rate in predicting the likelihood of heart disease.

DESIGN AND IMPLEMENTATION OF MULTIRATE FILTER FOR NEXT GENERATION WIRELESS APPLICATIONS

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Multirate signal processing plays an important role in modern communication receiver. This paper mainly focuses on reconfigurable multirate filter, especially for down conversion from high frequency to baseband frequency. The design consists of realization cascaded integrated comb (CIC) followed by half-band finite impulse response (HB-FIR) followed by symmetric systolic FIR (SSFIR) filter, and finally Farrow filter design using Lagrange interpolation make a perfect multirate system. All the filters are realized on computational efficient polyphase architectures. The reduction of multiplier blocks in each stage lead to area optimization. The proposed pipeline approach multirate filter can work in high clock speed. The decimation factor in each stage can vary according to system requirements and attain a satisfactory output. In addition, the truncation is used in each filter node to protect the overflow errors and floating-point data format improves the spurious free dynamic range (SFDR). The proposed model is simulated using Xilinx Vivado and targeted on field-programmable gate array (FPGA) platform. The experimental results show that the proposed design provides resource efficient, cost-effective and has improved in real-time applications.

NILGIRI TAHR OPTIMIZATION IN ECONOMIC LOAD SCHEDULING : A NEW APPROACH

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This paper introduces NilgiriTahr Optimization (NTO), a novel metaheuristic algorithm inspired by the grazing behavior of the NilgiriTahr, applied to optimize load scheduling in an isolated microgrid. The microgrid consists of diesel generators, a combined heat and power (CHP) plant, solar photovoltaic (PV) systems, wind turbines, and a biomass plant. The primary goal is to minimize total generation costs while meeting dynamic hourly load demands under operational constraints, such as ramp-up/ramp-down limits and capacity restrictions. The generation costs of diesel, CHP, and biomass units are modeled as quadratic functions, while wind and solar generation costs are based on wind speed and solar irradiance data, allowing accurate renewable integration.

The NTO algorithm optimally distributes load demand across power sources, balancing cost reduction with operational constraints and renewable variability. It uses iterative adjustments to meet load demand precisely while maximizing cost savings, achieving stable solutions with fewer iterations. The proposed method demonstrates faster convergence and lower generation costs than traditional optimization techniques, showing its efficiency in handling the complexities of microgrid management. Python-based simulations in a Jupyter environment validate the NTO's performance, highlighting its potential for practical microgrid applications where reliable and cost-effective load scheduling is critical.

Abstract ID: 115314

INVESTIGATING TRANSFORMATION OF COMMERCIAL CENTRES IN SUB-URBAN TOWNS OF WEST BENGAL: ESTABLISHING PERTINENCE OF STUDY

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Transformation is essentially the change of space and time that generates adaptation and is also termed as a systematic alteration in inherent functioning. From spatial perspective, physical transformation is the most pertinent and impactful of all.Commercial Centresare the place for business and exchange interaction. They sometimes are the most important public place in Sub-Urban Towns beside business. On the other hand, these Commercial Centres in these Sub-Urban Towns, increases its importance by accommodating more functions of higher order like service, public culture and administration, which induce the changes in the characteristics pattern of these towns leading to further chaotic and unplanned transformations with the advent of national and international franchises, e-commerce, shopping malls and multiplexes, and also by the intervention of unregulated market forces. As a result, in the states like West Bengal, these transformations are becoming mainly uncontrolled, haphazard and sporadic in nature, leading to forceful changes in the overall physical and spatial environment. Thus, it requires immediate intervention to apprehend further unplanned transformations and to rectify the same to a considerable extend.

In this perspective, the said research work would be undertaken and the attempt would be made to formulate the specific guidelines and recommendations for systematic Transformation in a consecutive and integrated manner.

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SMART TRASH SEGREGATOR: A SMART SOLUTION OF RECYCLING

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Rapid growth and increase of population in the urban areas are leading to increase in major waste produced by people. Since people are very careless about waste dumping (biodegradable and non-biodegradable) anywhere causing decrease in recycling the waste and because of this improper dumping of waste causes many diseases.

Considering this problem of improper dumping, a smart dustbin will differentiate biodegradable waste and non-biodegradable waste and dump the waste accordingly into the bins. The main goal of the project is to create an intelligent trashcan that can recognise biodegradable and non-biodegradable waste on its own. The device uses image processing technique to automatically differentiate between biodegradable and non-biodegradable waste. Additionally, the ESP32-CAM module will be used for the image processing technique, aiding in real-time detection. The camera takes pictures as soon as the trash is dumped, and the sensors provide oncoming of the trash. As a result it can prevent waste contamination and waste management sector to handle recycling process more effectively.

INTEGRATION OF IoT AND AI/ML SYSTEMS FOR POLLUTION CONTROL

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Pollution management in West Bengal is essential for public health and environmental sustainability. This study proposes a framework using Internet of Things (IoT) devices and Machine Learning (ML) algorithms for efficient pollution monitoring and control. IoT sensors will collect real-time data on air and water quality, while ML models like Long Short-Term Memory (LSTM) networks will forecast pollution levels. The framework also addresses trans-boundary pollution by using geospatial analysis and meteorological data to predict and mitigate effects from neighbouring regions.

Community engagement is key, facilitated through mobile apps that provide real-time pollution data and allow citizens to report environmental concerns. AI-driven analytics will support regulatory compliance by identifying industrial emissions that exceed legal limits. Predictive maintenance of IoT infrastructure is also included to ensure ongoing reliability.

These strategies will help West Bengal adopt a proactive, data-driven approach to pollution management, improving both regulatory enforcement and community involvement. This model aims to improve air and water quality and can be replicated in other states with similar environmental challenges, advancing sustainable development.

Abstract ID : 093636

NANO-ENHANCED CONCRETE: THE FIRST STEP TOWARDS UNPRECEDENTED DURABILITY AND SUSTAINABILITY.

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Globally concrete is the most extensively used material, but it often faces durability issues of cracking, chemical attack, and overall degradation. Nanotechnology one of the emerging area holds the prospective to enhance the life-span and performance of concrete. This paper attempts to give an overview of how nanomaterials introduced at the nanoscale level can alter the microstructure of concrete and further enhance the mechanical and chemical properties.

These nanomaterials, including nano-silica, carbon nanotubes, nano-titania, and nano clay, have been established to enhance the mechanical strength of concrete as well as reduce its permeability. They increase the resistance of concrete toward environmental factors; the sulphate and chloride attack. Filling of micro-voids and refinement of the cement paste with these nanomaterials improve the concrete's overall density, enhancing its resistance to cracking and chemical degradation. Also, the application of nanotechnology minimizes the ecological footprint of concrete due to the fact that such a product would need less usage of traditional cement, which is closely linked to the largest source of anthropogenic CO, emissions.

As such, this paper reviews the latest scientific findings on the application of nanotechnology in enhancing the durability of concrete. The survey here shows the different ways through which this new technology promises and raises significant issues regarding cost, scale-up, and long-term performance that must be explored further. This paper concludes by discussing future research directions where nanotechnology may revolutionize concrete durability into a new frontier in constructing sustainable and climate-resilient infrastructure.

Abstract ID: 114435

ADVANCED IMAGING TECHNOLOGIES FOR IMPROVING EARLY DETECTION AND DIAGNOSIS- A REVIEW

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The advent of advanced imaging technologies has revolutionized medical diagnostics, enabling clinicians to detect and diagnose diseases at earlier stages than ever before. These technologies provide high-resolution images and functional information, facilitating timely interventions that significantly improve patient outcomes. Magnetic Resonance Imaging (MRI) and Computed Tomography (CT) scans have long been staples in diagnostic imaging. Recent advancements, such as high-field MRI and dual-energy CT, offer enhanced image clarity and tissue differentiation. Positron Emission Tomography (PET) combined with CT or MRI has improved the detection of metabolic activity associated with cancerous tissues, aiding in early cancer diagnosis. The integration of Artificial Intelligence (AI) and machine learning algorithms into imaging analysis is a significant breakthrough. AI can detect subtle patterns and anomalies that may be overlooked by the human eye, increasing diagnostic accuracy. For instance, AI-assisted mammography has shown promise in early breast cancer detection, reducing false positives and unnecessary biopsies. Moreover, advancements in molecular imaging allow for the visualization of cellular functions and molecular processes in vivo. Techniques like Optical Coherence Tomography (OCT) provide high-resolution images of retinal structures, aiding in the early detection of ocular diseases. In this paper the advanced imaging technologies are critically reviewed which helps in improving early disease detection and diagnosis. Continuous innovation and integration of AI are expected to further enhance diagnostic capabilities, ultimately leading to better patient care and outcomes.

PHYSICAL SCIENCES

ABSTRACT ID: 082034

DESIGN AND ANALYSIS OF PERFECTLY REFLECTING TIO_2–BASED METASURFACES

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Dielectric metasurfaces are conventional in photonics owing to their ability to control light through high refractive index and low-loss materials. In this study, we have explored the optical properties of TiO_2 a material with a high refractive index (n > 2) and negligible absorption losses (k H ≈ 0), making it an excellent candidate for highly efficient dielectric metasurfaces. A systematic variation of the geometric parameters of the relevant metasurface elements, specifically the height (150–200 nm) and radius (95–100 nm) has been undertaken to investigate their impact on reflectance performance. Simulated reflectance spectra reveal the presence of electric and magnetic dipole resonances, leading to perfect reflection bands at wavelengths of 450 nm and 510 nm. These resonances are however confirmed through the analysis of the electric field distribution at the corresponding wavelengths. Among the various configurations tested, metasurfaces with a radius of 95 nm and a height of 200 nm demonstrated the highest reflectance efficiency, underscoring the dominant influence of the radius over the height in enhancing reflectance. Our simulations reveal that the height affects the position and width of the reflectance bands while the radius turns out to be the most critical parameter for achieving the maximum reflectance. This study provides substantial insights into the design and optimization of TiO_2 based dielectric metasurfaces, offering valuable guidance for future developments related to applications involving sensors, photonic devices, and light-manipulating technologies.

Abstract ID: 013347

BIOACTIVE GLASSES: STRUCTURAL CHARACTERIZATION, TRANSPORT PROPERTIES AND APPLICATIONS

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Bio active glasses, different from the conventional glasses, have wide applications in different fields. They have the ability to bond to soft or hard tissue and are biodegradable in the body. This property has helped the scientists to work in medical field with these bioactive glasses but their physical transport properties, like electrical, mechanical properties are yet to be explored. Most of the bioactive glasses are high melting SiO_2 containing glasses. But the presence of silica in the glass sometimes make problem in the body. This work will investigate upon the various applications of both Si and non-silicate bioactive glasses along with a detailed discussion on a typical non-silicate glass H_3BO_3-$Ca(NO_3)_2$-$NaNO_3$-$(NH_4)_3PO_4$ of different concentrations which are prepared and characterized by us. Furthermore, their transport properties will be also researched upon to reveal the novel features.

A NOVEL TWO-DIMENSIONAL METALLIC CARBON FOR LITHIUM-ION BATTERY WITH CONNECTED TETRAGONAL-PENTAGONAL RING

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The semi-metallic two-dimensional form of carbon, graphene, with all hexagonal carbon rings has remained as a prospective stable material for the researchers over the last two decades. However, the structural stability of two-dimensional carbon sheet with connected tetragonal-pentagonal carbon rings was uncertain for many years. Some planar carbon structures that have 4-5 carbon rings linked have recently shown signs of potential stability. In this study, we introduce a novel 4-5 ring carbon structure that fills the space with *Pmmm* space group symmetry with additional octagonal and dodecagonal rings. The dynamical, thermal, and mechanical stability of this structure have all been examined to ensure its structural stability. It is a non-magnetic metallic material according to its electrical structure. In-plane Young's modulus and Poisson's ratio indicate that the material is elastically anisotropic unlike graphene. Furthermore, the Fermi surface of the material indicates that within the first Brillouin zone it contains discrete electron and hole pockets. The material's quantum capacitance indicates that it could be used as an anode in asymmetric supercapacitors. In addition, the optical property of the material show low optical absorption in the visible-range along with distinct EELS peaks at low energy level. Analysis indicates that the material may also be useful as anode for lithium-ion battery application due to its high storage capacity of 558 mAh/g. The material reveals moderate migration barrier ranging from 0.03 eV to 0.69 eV and low open circuit voltage (0.001 V).

INVESTIGATION OF HIGH SPIN STATES FOR MAGNETIC ROTATION IN ^{116}SN

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The shapes and structural aspects of a nucleus are of tremendous interest in the field of nuclear studies. ^{116}Sn being a semi-magic nucleus has shown a conjecture of a variety of excitation modes. Though states in the lower-lying regime of ^{116}Sn have been well-studied, the higher levels being scarcely populated are yet to be investigated. Thus, to have an insight into the possible structure of the nucleus at such high spin states endeavours are presented here. The positive parity dipole band based on 11^+ states at 4.7MeV shows a cascade of strong M1 transitions and weak cross-over E2 transitions indicating the existence of Magnetic Rotational (MR) type features. This rotation - like phenomenon generally occurs when the coupling of high spin holes and particles dominates over the rotation of the weakly deformed core. One of the striking signatures for such MR bands is the ratio of the transition rate [B(M1)/B(E2)] among others. The calculation on the said ratio is done incorporating the experimentally obtained intensity and energy values of the associated γ-transitions taking no M1&E2 mixing. It shows large values and the decreasing trend of the ratio with spin asserts the presence of magnetic rotation. While this ratio along with other signatures is crucial in indicating the presence of magnetic rotation, the absolute values of transition rates are also important. However, the absolute B(M1) or B(E2) measurement requires lifetime measurement which is limited in the present experimental setup.

ABSTRACT ID: 120814

INVESTIGATING TRANSIT TIMING VARIATIONS IN THE EXOPLANET WASP-43b DURING THE TESS ERA

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Transit timing variations (TTVs) are currently recognized as a valuable tool in exoplanetary science for detecting exoplanets by analyzing variations in their transit times. Several plausible causes for TTVs have been identified, including orbital decay and apsidal precession. WASP-43b, an ultra-short-period hot Jupiter, provides an excellent opportunity to study orbital decay. Since its discovery, the presence of TTVs in this system has been a topic of considerable debate. Building on prior research, we have compiled high-quality transit light curves from all three sectors of NASA's Transiting Exoplanet Survey Satellite (TESS), alongside the best-quality light curves (Data Quality, DQ < 3) from the Exoplanet Transit Database (ETD) and all available mid-transit times from the literature. We performed transit timing analysis utilizing Machine Learning (ML) techniques in conjunction with Markov Chain Monte Carlo (MCMC) algorithms implemented through the emcee package. Our precise transit timing analysis shows a significant improvement in the orbital ephemerides; however, application of the Generalized Lomb-Scargle Periodogram did not reveal any short-period TTVs indicative of an additional body, as the False Alarm Probability (FAP) levels were below the threshold levels of 1% and 5%. Additionally, we modeled the light curves and refined the values of stellar and planetary parameters using the Transit Analysis Package (TAP). Our results are more consistent with a linear ephemeris than with orbital decay. Further precise photometric measurements are necessary to validate our findings.

ABSTRACT ID : 063608

STUDY OF BRANEWORLD BLACKHOLE IN THE EXPANDING UNIVERSE

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The braneworld description of our universe entails a large extra dimension and a fundamental scale of gravity that might be lowered by several order of magnitudes compared to Plank scale. The existence of braneworld blackhole may be of primordial origin. They obey a modified mass-radius relationship compared to standard Schwarzschild blackhole. In this work we try to study braneworld blackhole in the expanding universe. We construct the braneworld metric in the background of FRW universe. We obtain the expression for event horizon, photon sphere, blackhole temperature of the new braneworld metric under expanding universe. We observe the notable modifications of these quantities compared to standard Schwarzschild metric. Finally we discuss how the evolution of the universe influences the braneworld blackhole space time.

ABSTRACT ID : 053132

UNVEILING THE NATURE OF KILOHERTZ QPOs IN 4U 1636-536 : TEMPORAL AND SPECTRAL INSIGHTS FROM ASTROSAT

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Kilohertz quasi-periodic oscillations (kHz QPOs) are thought to arise from the orbital timescale of the inner accretion flow, reflecting the dynamics of the innermost regions of the accretion disk where strong gravitational forces are significant. While several models have been proposed to explain these features, none have achieved a comprehensive understanding. This study systematically investigates kHz QPOs, their temporal variability, and their connection with the spectral properties of 4U 1636-536 using observations from *AstroSat*. Our analysis reveals the source's transition from a hard to a soft state in the hardness-intensity diagrams. Spectral analysis over a broad energy range (0.7-25 keV) using SXT and LAXPC data shows a reflection component that intensifies as the source moves to a softer state. This spectrum likely originates from reflection off a thermal corona, influenced by boundary layer emission and an additional soft disk component. We observe significant variations in optical depth, black body temperature, and disk temperature that may drive these state transitions. Temporal analysis uncovers three distinct variability types in the Power Density Spectrum: a lower Hz QPO (~30 Hz), an upper kHz, and a lower kHz QPO. These variabilities, absent in harder states, become prominent in softer states, allowing us to constrain the neutron star's mass using the relativistic precession model (RPM), yielding a mass of 2.40 ± 0.02 solar masses. Additionally, time-lag and root mean square (rms) analysis provide insights into the corona's size and the radiative origins of these variabilities, highlighting differences between the upper and lower kHz QPOs and emphasizing their significance in understanding the underlying mechanisms of the system.

ABSTRACT ID: 065346

ATOMIC ENTANGLEMENT AND COHERENCE MEDIATED BY THE FOCK STATE CAVITY FIELD : A QUANTITATIVE STUDY

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Quantum entanglement and quantum coherence are two important manifestations of the superposition principle. In this paper, we show the influence of the photon statistics of the Fock state field on atomic entanglement and coherence of two excited atoms. We compute the atomic entanglement and coherence generated between two experimental atoms that pass successively the micromaser cavity. The interaction between a two-level atom and quantized electromagnetic field is governed by Jaynes-Cummings model. An interesting comparison will be drawn with the case of Tavis-Cummings model which is employed when two atoms are present simultaneously inside the micromaser cavity. We obtain various important results of atomic entanglement and coherence in different cases.

METAL-FREE GROUP-IV CARBIDE HETERO-NANODOTS : MAGNETIC EDGES, CIRCULAR DICHORISM AND EFFICIENT GAS SENSING PROSPECTS

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The recently successful large-area bottom-up synthesis of two-dimensional honeycomb layer of silicon carbide (SiC) (PRL 130 076203 2023) has unquestionably outstretched newer routes in tackling the underlying intriguing physics of graphene-like monolayers with diverse functional sectors. In this work, we have tailored group-IV carbide monolayers such as SiC, GeC and their single-layer heterojunction (J. Appl. Phys. 132 184301 2022) to have six stable quantum dots and critically explored their electronic nature, magnetic edges, electronic transitions with subsequent characterization of circular dichorism and high sensitivity towards environmentally hazardous gases through first-principles. Quantum dots (QDs) with zigzag edge reveal their spin-splitted electronic nature with traces of fluorescence around the short-wave infrared (SWIR) region. Interestingly polar QDs of SiC-GeC display chiral nature with an asymmetric point group which have been explored using vibrational and electronic dichorism. Presence of the junctions between the two different carbides however enhance the gas sensitivity to around 86% which is significantly higher than that of the individual constituents, paving the way for further environment-friendly applications.

ABSTRACT ID: 100514

A NEW PHASE OF MONOLAYER GERMA-GRAPHENE

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Experimental feasibility of implanting germanium into a graphene system (Tripathi et al., ACS Nano 12 (2018) 4641–4647) motivates us to investigate the prediction of a new phase of monolayer germa-graphene structure using first-principles calculations. In this work we verified the stability and explored the mechanical response and electronic/optical properties of monolayer rectangular-germagraphene. The structure displays auxetic behaviour and exhibits a brittle nature. Tiny and anisotropic carrier effective masses suggest rapid carrier transport properties and increase the efficiency of photogenerated electron-hole separation. Based on GGA-PBE results, the rectangular-germagraphene monolayer exhibits a semiconducting electronic nature with a quasi-direct band-gap of 0.4 eV, whereas the HSE06 estimation indicates that the monolayer exhibits a band-gap of 0.5 eV, which is highly encouraging for use in nanoelectronics. According to optical results, rectangular-germagraphene has the ability to absorb visible, infrared, and near-infrared light. All these exotic properties could be a good option for nanoelectronics and nanooptics devices.

PRESSURE INDUCED TOPOLOGICAL PHASE TRANSITIONS IN LANTHANUM NITRIDE : AN ACCOUNT FROM FIRST-PRINCIPLES STUDY

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The pressure driven topological phase transitions in lanthanum nitride (LaN) have been explored from first-principles density functional theory followed by maximally-localized Wannier functions (MLWFs) calculations. While the DFT calculations have been performed using hybrid B3LYP functional within the Quantum ESPRESSO software, the MLWFs calculations have been implemented in Wannier90 suite of software. LaN undergoes structural phase transitions from face-centered cubic (Fm3m) to primitive tetragonal (P4/nmm) phase at pressure (P) = 22.8 GPa and then from P4/nmm to simple cubic (Pm3m) phase at P = 90 GPa. Detailed investigations of their electronic band structures in presence of spin-orbit coupling (SOC) exhibit the occurrence of band inversion between valence band maximum and conduction band minimum of P4/nmm phase at P = 70 GPa. This band inversion results an early signature of topological insulator (TI) for the P4/nmm phase of the system. Although the calculations of 3D topological Z_2 invariants for P4/nmm phase at P = 70 GPa with (ν_0; ν_1 ν_2 ν_3) = (1; 000) indicate its strong TI behaviours, the Pm3m phase with Z_2 invariants (ν_0; ν_1 ν_2 ν_3) = (0; 011) at P = 91 GPa acts as a weak TI. Akin to Z_2 invariants, similar TI behaviours have also been noticed from the estimations of surface states for P4/nmm and Pm3m phases of LaN. Thus, origin and modulation of the TI properties of LaN may bear its potential applications in spintronics, dissipationless transistors and also in designing advanced devices in the future endeavour.

STUDYING VARIOUS ASPECTS OF QUANTUM INFORMATICS AND DNA HELIX

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It has been discussed here that when spins are positioned on the axis of an antiferomagnatic chain, a DNA molecule may be mapped into a Heisenberg spin information system. In terms of gauge fields, this aids in our understanding of the elastic and topological characteristics of a DNA molecule. An effective correspondence between the thermodynamic entropy and the entanglement entropy of the quantum spin system in a supercoil is pointed out. Key elements of the Rod-Like-Chain model are replicated in the model, avoiding the “RLC model crisis”.

Abstract id: 075923

DISTANCE SCALE MEASUREMENT OF NOVA USING THE MAXIMUM MAGNITUDE VERSUS RATE OF DECLINE [MMRD] PROCESS

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The Maximum Magnitude vs. Rate of Decline (MMRD) method is an effective tool for estimating distances to novae, allowing calculations of peak luminosity independent of distance measurements.

Initially formulated by Zwicky, the method is grounded in the assumption of instantaneous energy release during nova outbursts, linking peak luminosity to the rate of decline. Subsequent refinements by Mac Lauglin addressed significant errors, leading to a more accurate understanding of these relationships.

Novae are classified into fast and slow decline categories based on their luminosity, which aids in applying the MMRD method across different types.

A two-step calibration process further enhances the reliability of distance estimates, making the MMRD method applicable to both Galactic and extragalactic novae.

ISOSPIN SYMMETRY BREAKING IN MIRROR PAIR ^{19}F - ^{19}Ne

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The near equality in mass between the proton and neutron reflects isospin symmetry. The Coulomb interaction, along with other isospin non-conserving forces breaks the symmetry, causing energy differences between the analogue states of the mirror-pair, known as the Mirror Energy Difference (MED). In the present work, we have investigated the existence of isospin symmetry in the ^{19}F and ^{19}Ne mirror nuclei. The ^{19}F and ^{19}Ne nuclei were populated through the reaction of ^{9}Be as projectile with energy 37 MeV incident on 10.8 mg/cm^2 thick oxidized lead (PbO) target using Pelletron-LINAC facility at the Tata Institute of Fundamental Research (TIFR), Mumbai. The Indian National Gamma Array (INGA), consisting of 14 Compton-suppressed clover detectors at different angles, was employed to detect the de-exciting gamma rays. The experimental values of the MED of ^{19}F-^{19}Ne, obtained from the present work, were theoretically reproduced within the framework of the shell model calculations up to the $13/2^+$ state using the various Single Particle Energy (SPE) corrections to achieve the best agreement with the data. Although some states were significantly influenced by the SPE correction, none yielded a superior agreement with the experimental data. The best agreement with the experimental data was achieved by introducing a 30 keV isovector interaction. In conclusion we can say isospin non-conserving forces are as important as Coulomb interaction in generation of angular momentum states in mirror nuclei.

RABI OSCILLATION

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The quantum mechanical interaction of radiation (oscillating magnetic field) with two-level system gives rise to an interesting oscillation between two states. This is called ***Rabi oscillation*** (Isidor Isaac Rabi, Nobel prize in Physics, 1944 for the discovery of Nuclear Magnetic Resonance). This is a continuous change in the probability of finding the system in any one of its states in contrast to the discrete process of absorption and stimulated emission of photons. In this poster, I will theoretically demonstrate the Rabi oscillation observed in a spin-1/2 system even in the presence of a **constant magnetic field**. The frequency of such oscillation will be calculated in terms of the magnetic field.

Abstract Id: 120506

WATER DROP-MEDIATED TRIBOELECTRIC NANOGENERATOR EMPLOYING MICROPOROUS POLYMERIC FILM, USING SINGLE-STEP MICROWAVE IRRADIATION

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Water provides abundant mechanical energy which could be a clean alternative to conventional energy sources. Typical hydropower stations can only work for water flowing with high velocity and are incapable of harvesting small-scale water flow. To address this, researchers are exploring triboelectric nanogenerator (TENG), which offers a sustainable solution by converting mechanical energy from water drops into electrical energy and thereby powering up small electronic devices. When two materials with different triboelectric polarities come into periodic contact and separation, they create electric potential differences. This drives the flow of electrons through an external load, enabling the generation of electrical output. Herein, we report a contact electrification mediated, water drop-driven TENG using PDMS nanocomposite and silk as the two triboelectric layers. The polymeric nanocomposite was integrated with flower-like CuS nanoparticles and was uniquely fabricated through a single-step baking technique using microwave irradiation, resulting in the formation of micropores within the composite film. TENG demonstrated an impressive voltage of 172 V and effectively illuminated 86 blue LEDs with simple hand-imparted force. Exceptional sensitivity of 34.4 V/kPa allowed the device to efficiently harvest mechanical energy from water drops. When exposed to water splash from different heights, the TENG produced varying output voltages that possibly make it suitable to be used as a velocity sensor and can harness energy from randomly falling raindrops. Hence, this work introduces a simple and efficient method for harvesting energy from water drops that offers a straightforward approach for small-scale energy harvesting and sensing applications.

SELF-POWERED AND LIGHTWEIGHT ELECTRONIC SKIN (E-SKIN) BASED ON ZnS@PDMS NANOCOMPOSITE FOR HUMAN BODY MOVEMENTS DETECTION

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Flexible, lightweight and self-powered electronic skin (e-skin) has gained immense attention due to its potential applications in multi-dimensional fields like human-machine interactions, healthcare units, medical diagnosis and robotic gestures. Moreover, the versatile features of e-skin like self-powered ability, easy fabrication process, naturally friendly behavior and low fabrication charges, not only attract the researchers but also open up its utilization towards industrial uses. Herein, a self-powered, stretchable and lightweight e-skin has been designed with the help of a charge-generating layer, co-triboelectric layer and conducting cloth that serves as an electrode. The charge-generating layer consists of flower structure ZnS incorporated PDMS nanocomposite where the incorporation of ZnS enhances the electronegativity of the nanocomposite by inducing the charge accumulations. Furthermore, the intermediate layer or co-triboelectric layer is employed to improve the output performance by generating more negative charges on the surface of the nanocomposite. Thus, our fabricated layered structured e-skin exhibits colossal output performance with a maximum power density of 2.5 W/m^2 under periodic finger tapping conditions and generates electricity from mechanical energy resources. Additionally, the e-skin can successfully detect different human body movements like heel pressing, forefoot tapping, wrist up-down, elbow bending etc. Owing to high sensitivity (20.1 V/kPa) at low-pressure region (less than 0.5 kPa), the e-skin generates electricity from blood flow. Besides this, the energy conversion ability of e-skin is investigated by LEDs illuminating and capacitor charging process. Thus, the self-powered e-skin could be a potential candidate in healthcare applications and robotic gesture sensing.

ABSTRACT ID: 043712

FABRICATION OF ALL LIQUID WARM WLEDS WITH TUNABLE PROPERTIES FOR ARTIFICIAL LIGHTING AND CANCER CELL IMAGING

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White light-emitting diodes (WLEDs) have emerged as highly promising 21st-century innovations due to their compact design, structural simplicity, and extended lifespan. They find versatile applications in indoor and outdoor lighting, display technologies, and are significant in visible light communication. Phosphor-converted LEDs can emit white light through three primary strategies: blue LED chips combined with yellow phosphor, UV chips with red, green, and blue (RGB) phosphors, and UV chips paired with rare-earth (RE) phosphors. However, blue/yellow-based WLEDs often suffer from lower Color Rendering Index (CRI) due to insufficient long-wavelength light, impacting color accuracy and potentially causing visual fatigue. High-CRI WLEDs (CRI >90) are essential for environments like museums and studios that require precise color contrast. Although RGB phosphor-UV chip WLEDs achieve high CRIs, their complex fabrication, costly materials, and challenges in color balance limit their scalability. Liquid organic light-emitting diodes (OLEDs), with benefits like stable colors and simple manufacturing, are thus gaining attention. In this work, we present an eco-friendly, innovative WLED system that delivers high-quality white light with CIE coordinates (0.33, 0.35), a CRI of 84, and a correlated color temperature (CCT) of 5618K. Our system uses a combination of carbon quantum dots (CQDs), fluorescein dye, and gold nanoclusters, achieving enhanced energy transfer efficiency (67% to 82%) with an agarose gel matrix for stable optical properties. This WLED fabrication approach shows potential for diverse luminescent applications and may also assist in differentiating cancer cells from normal cells.

ROOM TEMPERATURE GREEN CHEMISTRY SYNTHESIZED A NOVEL MATERIAL AS A GOOD PHOTOCATALYST AND AN ANTIBIOTIC

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Water pollution is a major issue our world is facing today. Industries like cosmetics, textile, pharmaceutical, fertilizers are primarily accountable for this. Out of them, textile industries are a major source of environmental pollution because the large amounts of wastewater produced by them contains dyes that are often non-biodegradable and highly toxic, posing significant risks to aquatic ecosystems and human health. Among the various techniques developed to curb water pollution, the most promising one is photocatalysis, which is an efficient and eco-friendly method. Zinc oxide (ZnO) nanoparticles are among the most investigated photocatalysts due to their high photocatalytic activity, stability and nontoxicity at a relatively low cost. ZnO nanoparticles can break down dyes under UV light, converting poisonous organic pollutants into non-toxic byproducts. In this study, Copper doped ZnO nanoparticles have been synthesized using the green synthesis method at room temperature. Detailed characterizations of the nanoparticles were performed using X-Ray diffractometer, Scanning Electron Microscope, UV-Visible absorption Spectrometer, and Fluorimeter. The synthesized Cu doped ZnO nanoparticles showed good photocatalytic activity in degrading the strong textile dyes under solar light illumination. In addition, the nanoparticles also exhibited excellent antibacterial property, hence the synthesized nanoparticles can serve as a good material for waste-water treatment and water recycling.

ABSTRACT ID: 120041

ULTRAFAST DEPOSITION OF ZNO AND ITS APPLICATIONS

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Two dimensional nanomaterials gives us an unique physical and chemical properties, which shows a greater potential in catalysis and electronics/optoelectronic devices. Since two dimensional nanomaterials has high surface to volume ratio which provides us large specific surface area or adsorption of molecules making them more useful in various applications.

Two dimensional ZnO deposition provides us various structures such as nanosheets, nanowalls, nanoflakes, nanoplates and nanodisks, which is helpful in application of energy storage or conversion, data storage and memory devices. ZnO has many advantages such as high sensitivity, stability and low cost, which makes it the most investigative material. In this work, we have deposited the ZnOnanoflakes at an interestingly small period of time which none have achieved, and furthermore we have studied the morphology and structure of thetwo dimensional structures of the ZnOnanoflakes deposited on the ITO substrate.

STIMULI RESPONSIVE DUAL-FUNCTIONAL NANOCOMPOSITES: A NEW FRONTIER IN ENVIRONMENTAL REMEDIATION AND ANTIBACTERIAL APPLICATIONS

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Rapid urbanization and industrialization have increased water pollution, demanding an urgent need for sustainable wastewater treatment technologies. Simultaneously, multidrug-resistant (MDR) bacteria, driven by antibiotic overuse, threaten public health. Piezo-photocatalysis offers a promising dual solution by merging photocatalysis with piezoelectric effects to enhance pollutant degradation and bacterial inactivation. Herein, we developed erbium-doped zirconium oxide decorated phosphorene (BP/EZO) nanocomposite, which serves as an effective piezo-photocatalyst for the degradation of organic effluents from wastewater. Synthesized through a water-ethanol-assisted method followed by hydrothermal technique, the BP/EZO nanocomposite was extensively characterized by XRD, FTIR, Raman, TEM, SEM, XPS, BET, and AFM, confirming its structural integrity, phase purity, and surface properties which enable its high catalytic activity. The nanocomposite removed 99.32% of CR dye from water in 60 minutes with highest catalytic efficiency obtained under optimized conditions: alkaline pH, 2.5 mg/mL pollutant concentration, and 2.5 ppm dye concentration, while maintaining 96.5% efficiency after four consecutive cycles. Under ultrasonication and visible-light co-excitation, this catalyst achieved a first-order rate constant of 0.0556 min^{-1}, 1.82 times higher than ultrasonication alone and 2.66 times higher than with visible-light irradiation alone. Moreover, BP/EZO also degraded 87.02% of MB and 77.38% of MO and achieved 95.75% degradation in drinking water and 98.11% in wastewater within 60 minutes. Scavenger's experiment confirmed reactive oxygen species (ROS) generation, especially hydroxyl radicals (·OH), accelerating the degradation process. Motivated by these results, we applied this piezo-photocatalytic process for *S. aureus* pathogenic bacterial eradication, achieving nearly 99% effectiveness, and emerged as a potential alternative to traditional antibacterial method.

NEXT-GENERATION SELF-STANDING AND REUSABLE BIOPOLYMER-BASED PIEZO-RESPONSIVE MEMBRANE FOR EFFICIENT ORGANIC EFFLUENTS DEGRADATION AND PATHOGENIC BACTERIAL ERADICATION FROM WASTEWATER

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Piezocatalysts are recognized for converting mechanical energy into chemical energy, yet their use is limited by inefficient charge reactions and low mechanical durability. To address this, we developed a flexible, reusable, self-standing chitosan (CHS) composite membrane containing bio-waste-derived chemically synthesized carbon nanofibers (MCCNFs) and cobalt manganate (CMO) perovskite nanoceramics via solvent casting method. Comprehensive characterizations confirmed the presence of polar phases, MCCNFs, and CMO in the ternary bio-nanocomposite. The membrane demonstrated excellent piezocatalytic performance under ultrasonication, efficiently degrading cationic (89.93%, of MB), anionic (99.2% of CR and 82.37% of MO), and mixed (76.35% of 1:1 MB and CR) carcinogenic dyes within 35 minutes, with enhanced catalytic efficiency under optimized conditions: alkaline pH, 60 W ultrasonic power, and 2.5 ppm dye concentration. In real-world tests, the membrane achieved 96.21% and 98.23% degradation in drinking and wastewater, respectively. Using LC-MS analysis and frontier molecular orbital theory, we outlined the degradation pathways of CR and demonstrated the reduction in ecological toxicity through phytotoxicity tests on neem plants. Moreover, the water flow-driven piezoelectric catalytic system consumed only 1.2% of the energy required by ultrasonic systems, highlighting its potential for large-scale, energy-efficient wastewater treatment. Additionally, the membrane efficiently degraded pharmaceutical pollutants such as ciprofloxacin, tetracycline and exhibited over 99% antibacterial activity against *E. faecalis*. Finally, Quantitative ROS analysis showed that MCCNFs enhance the piezocatalytic activity of the CMO composite film compared to CHS films with only CMO or bare CHS. Thus, this versatile, free-standing membrane shows great potential as a sustainable solution for wastewater treatment.

SPECTROSCOPIC DETERMINATION OF ATMOSPHERIC CARBON DIOXIDE AND WATER VAPOUR CONCENTRATIONS FROM AVIRIS-NG HYPERSPECTRAL IMAGES FOR THREE DISTINCT REGIONS OF INDIA

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Atmospheric carbon dioxide (CO_2) and water vapour (H_2O) are two important greenhouse gases, which largely control the terrestrial temperature by absorbing the outgoing longwave radiation. The spatial variations of the abundance of these gases over urban and rural regions indicate the role of human activities. This work estimates the spatial distributions of atmospheric CO_2 (in ppm) and H_2O (in g/cm^2) concentrations for the urban and rural areas of three distinct regions of India, namely Kota, Patna and Sundarban. This is an application of a physical technique, absorption spectroscopy, to terrestrial entities. The spectral absorptions of the trace gases are derived from the Airborne Visible/Infrared Imaging Spectrometer Next Generation (AVIRIS-NG) hyperspectral images of these regions by continuum interpolated band ratio (CIBR) approach. The ratio of the at-sensor radiance at the absorbing and non-absorbing bands are estimated by interpolating with proper weighting factors. The gas concentration for each pixel is obtained with the CIBR and some other parameters. Those parameters are obtained separately from radiative transfer model simulated by MODTRAN6 code for each region and for each trace gas. The colour mapped images of populated and vegetated areas show wide variation of both CO_2 and H_2O across the land cover. The potential applications of such studies are the relative abundance of CO_2 at urban and rural areas correlating urban sprawl and the interrelations of the spatial distributions of CO_2 and H_2O in the environment.

Evidence of Octupole Excitation in ^{82}Kr

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Nuclei in mass A~80 region are a crucial laboratory to observe the interesting nuclear structure phenomena and to test a variety of nuclear models. Multipole modes of excitation depend on the occupancy of the valance particles in the particular orbitals, which leads to various nuclear shapes. In the present work, we have investigated the existence of octupole correlation in the **^{82}Kr** nuclei. The excited states of ^{82}Kr have been populated through the reaction of the 31-MeV ^{9}Be projectile with the 4.2 mg/cm^{2} thick ^{76}Ge target using Pelletron-LINAC facility at the Tata Institute of Fundamental Research (TIFR), Mumbai. We have observed two negative parity bands (DB1 and DB2) and eleven inter-band parity changing E1 transitions in ^{82}Kr. The level lifetimes of both dipole bands (DB1 and DB2) in ^{82}Kr have been extracted using the Doppler Shift Attenuation Method (DSAM). To understand the microscopic origin of the levels of the DB1 and DB2 in ^{82}Kr, we have performed large basis shell model (LBSM) calculations and compared with the experimental result. We have observed strong **E1** transitions with large B(E1) transitions rates. This enhancement of E1 transition rates were obtained in the present work supports the existence of octupole correlations in the ^{82}Kr nuclei. Thus the positive parity band and negative parity bands (DB1 and DB2), connected through the parity changing transitions, indicate the existence of octupole correlation in ^{82}Kr.

EINSTEIN'S AND SMOLUCHOWSKI'S EQUATION OF BROWNIAN MOTION

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Brownian motion is one of the most interesting phenomena of Statistical Mechanics which was first discovered by Scottish Botanist Robert Brown in 1828 while observing the movement of the pollen grains suspended in water under microscope. Later it was discovered that cause of such random movement is due to the random collision of the particles with the molecules of the fluid. The first detailed mathematical description of Brownian motion was given by A. Einstein in his number of papers in 1905 based on so-called Random Walk problem and thereby establishing the irreversible nature of the phenomena. Smoluchowski's approach to the problem of Brownian motion was essentially same as that of Einstein, the difference lay in the mathematical description. In this poster presentation, the detailed concept applied by Einstein and Smoluchowski to describe the Brownian motion of particles will be discussed.

PHYSIOLOGY AND MEDICAL SCIENCE MERGED INCLUDING FORENSIC SCIENCES

A PREVENTIVE INVESTIGATION ON THE BACTERIAL GHOST INDUCED BY CURCUMIN NANOPARTICLES AGAINST *HELICOBACTER PYLORI* IN THE C57BL/6 MODEL

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Curcumin, the primary active compound in Curcuma longa, has shown promise in combating *Helicobacter pylori* and other intestinal pathogens. Bacterial ghosts are empty cell membranes devoid of cellular components, not produced by bacteria. In this study, a bacterial ghost-based immunogen created with curcumin nanoparticles (CurBGs) is being developed and evaluated as a potential vaccine candidate against *H. pylori* in a C57BL/6 mouse model. The minimum inhibitory concentration (MIC) of curcumin nanoparticles (CurNPs) was determined using agar dilution, and the hydrodynamic size of the nanoparticles was measured using DLS. A log phase bacterial culture was exposed to a concentration of 2xMIC for 18 hours, resulting in the complete eradication of viable colonies. Protein profiling was conducted on a whole cell lysate (WCL) of the immunogen strain and CurBGs. C57BL/6 mice were immunized with CurBGs on days 0, 14, and 28 to assess their immunogenicity. Mice immunized with CurBGs showed significantly higher levels of serum immunoglobulins compared to the control group, with antibodies specifically targeting CurBGs detected in Western blot analysis. Elevated levels of mucosal immunity were observed through increased secretory IgA (sIgA) production. Cytokine analysis of splenic cells from immunized mice showed elevated levels of IFN-γ, IL-1β, TNF-α, IL-13, and IL-17, indicating a cellular immune response. The effectiveness of the vaccine was tested by exposing vaccinated and non-vaccinated mice to wild type SS1 through oral administration and examining histological changes and colonization. Overall, CurNPs-treated bacterial ghosts stimulated a significant immune response in the C57BL/6 model with no adverse effects.

Abstract ID: 122304

PROBIOTIC- PREBIOTIC-BASED PROPHYLACTIC TREATMENT AMELIORATES ENTEROTOXIGENIC E. COLI (ETEC) INDUCED DIARRHOEAL PATHOLOGIES IN MICE

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Background

Enterotoxigenic E. coli (ETEC) is the leading causative agent of travelers' diarrhea in developing countries, ETEC can possess heat-stable (ST) and/or heat-labile (LT) enterotoxins and colonizing factors (CFs). Due to its high genetic plasticity, ETEC vaccine development encounters several challenges. A stand-alone effective vaccine against ETEC has still not been on the market. In this study. we approached prebiotic-probiotic-based preventive therapy against ETEC infection.

Methods

BALB/c mice were separated into control, ETEC, Inulin (IN), probiotic and synbiotic groups (Probiotic + IN). Diarrhea was induced with ETEC H10407 strain (10/ml). 10/ml of each probiotic organism was orally given to individuals, and Inulin (10 mg/0.1 ml) was added to probiotics for the synbiotic groups. Ileal colonies of ETEC were counted and confirmed with the colony PCR technique. Immune cell population and cytokine analysis by FACS and ELISA. H & E staining for Ileal histological analysis. Tight junction analysis by qPCR and immunofluorescence.

Result

ETEC colonization in the ileum is significantly less in synbiotic-fed mice compared to the ETEC group. Cytokine analysis reveals the downregulation of major pro-inflammatory cytokines such as TNF-a, IL 6, IFN-y and neutrophil chemoattractant CXCL-1. Tight junction protein analysis reveals significan upregulation of Occludin in synbiotic group and downregulation in ETEC group, in contrast, significant downregulation of Claudin-2 in synbiotic group and upregulation in ETEC group.

Conclusion

Prophylactic synbiotic administration effectively decreases the pathologies associated with ETEC induced diarrhea.

ABSTRACT ID: 080713

ORAL INFECTION MICE MODEL FOR SHIGELLOSIS AND A GLOBAL VACCINE AGAINST *SHIGELLA* SEROVARS

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Shigella species are locally invasive and induce dysregulated inflammatory response in the mucosa of colon and rectal tract of human. No adult mice model is available for oral *Shigella* infection that replicates human shigellosis. We have developed an animal model that resembles the pathological characteristics of human illness by oral *Shigella* infection in mice. In infected mice, body weight changes and bacterial colonization in the intestine were monitored in a time-dependent manner. Histological scoring was performed to determine the tissue destruction and ELISA was used for inflammatory responses. Mice infected with virulent *S. flexneri 2a*, shows significant weight loss and diarrhoea. Bacteria was found in the intestinal organs and feces, with significant tissue destruction and severe intestinal inflammation observed after post-infection. We also demonstrate a new vaccine, recombinant *Shigella* invasion protein IpaB with this model after intranasal vaccination. Vaccinated mice show humoral and cell-mediated immune responses and were protected 80-90% against oral challenge with *S. flexneri*2a, *S. dysenteriae*, *S. sonnei.* So, the newly developed oral *Shigella* infection mice model help to reduces the drawbacks of vaccine efficacy and other physiological research of human shigellosis as well as we successfully developed a new broad-spectrum subunit vaccine against all *Shigella* serovars.

ABSTRACT ID: 043005

FUNCTIONAL CHARACTERIZATION OF THE INTERACTION BETWEEN DNA GYRASE AND S-ADENOSYLMETHIONINE SYNTHETASE IN *ESCHERICHIA COLI:* EVALUATING ITS POTENTIAL AS NEW THERAPEUTIC TARGET

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The global threat posed by the emergence of multi drug resistantbacteria has prompted a resurgence in antibacterial research with an aim to develop antibiotics with novel mechanism of action. Protein-protein interaction (PPI) forms the basis of several vital cellular processes in bacteria. Targeting these interactions can result in bacterial cell death. Functional characterization of PPIs would unravel a vast source of potentially new therapeutic targets. Prokaryotic PPIs are well-conserved and lack close human homologues, thereby offering an opportunity to develop drugs with broad-spectrum activity against multiple bacterial pathogens with minimal side effects in humans. Here, our efforts towards functional characterization of observed physical interaction between two essential proteins from *E. coli* viz. DNA gyrase and S-adenosylmethionine Synthetase will be discussed. DNA gyrase is a popular anti-bacterial drug target. However, in many pathogens, this enzyme has developed resistance by accumulating mutations at the drug binding sites. To combat these resistant pathogens, efforts are directed towards identifying distinct vulnerable surfaces on DNA gyrase via studying its interactor proteins. SAM synthetase (Met K) was shown to be a member of DNA gyrase interactome in *E. coli* based on the large-scale purification by affinity chromatography. MetK produces S-adenosyl methionine(SAM), that plays a vital role in cellular metabolism by serving as the methyl group donor. The reported physical interaction between these enzymes was validated with biochemical assays. MetK was found to be a DNA gyrase inhibitor. Insights from our study would aid in developing improved therapeutic strategies to effectively counter antimicrobial resistance in future.

ABSTRACT ID: 055031

THE EPITHELIAL BARRIER AND ITS RELATIONSHIP WITH RNA BINDING PROTEIN, AUF1 IN INFLAMMATORY BOWEL DISEASE

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Inflammatory bowel disease (IBD) is a chronic inflammatory condition characterized by epithelial abnormalities. AUF-1 is a ubiquitous RNA-binding protein that acts as a post-transcriptional regulator of numerous RNAs, including mRNAs encoding inflammatory mediators, cytokines and growth factors. In the context of intestinal diseases, decreased level of AUF-1 is thought to contribute to the development of leaky gut, however the mechanism is yet to be discovered. Here we aimed to investigate how the absence of AUF-1 influences the junctional protein in the regulation of barrier function and intestinal permeability which may lead to the development of spontaneous colitis by using unique antisense morpholino oligo against AUF-1 to create systemic knock down. Our study also found that p37 isoform of AUF-1 stabilizes occludin mRNA, while p40 subunit is associated with claudin-2 mRNA. We have used the sophisticated three-dimensional human colon organoids from colon biopsy samples of IBD patients as well as the DSS induced colitis model in C57BL/6 mice and AUF-1 knock down mice model to verify our in-vitro findings. Mice model data also revealed the leaky gut, shortening of colon length, occult bleeding and bacterial translocation in AUF-1 knock down mice, similar to the pathophysiology of DSS induced colitis mice. The study analyzed the physical and functional characteristics of control, AUF-1 knockdown, and inflamed organoids from IBD patients to identify epithelial abnormalities linked to IBD. The study suggests that AUF-1 regulates the function of junctional proteins, potentially paving the way for a therapeutic approach for IBD.

ABSTRACT ID: 124357

A NOVEL STRATEGY FOR TARGETING ENTERIC DISEASES WITH A BIVALENT OMVs BASED CONJUGATED VACCINE AGAINST TYPHOID AND SHIGELLOSIS.

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Typhoid fever, caused by *Salmonella* Typhi, and shigellosis, primarily caused by *Shigella sonnei*, remains major public health concerns, especially in regions with limited access to clean water and sanitation. These enteric infections are exacerbated by the rise of antimicrobial-resistance (AMR), making current treatment options less effective. Although vaccines exist for typhoid fever, they have limitations, including short-lived immunity and reduced efficacy. Moreover, no licensed vaccine is available for shigellosis, despite ongoing research. To address these challenges, we developed a novel conjugate vaccine utilizing outer membrane vesicles (OMVs) derived from *S*. Typhi and *S. sonnei*. OMVs are naturally secreted by Gram-negative bacteria and contain key surface antigens, including lipopolysaccharides (LPS) and outer membrane proteins (OMPs), which elicit strong immune responses. The conjugation of OMVs from both pathogens in a single vaccine aims to provide cross-protection and stimulate broad immunity, addressing the limitations of current vaccines. Preliminary findings suggest that the conjugated OMVs are larger in size than individual OMVs and elicit a strong immune response. Our results highlight the promise of OMV-based vaccines in combating enteric diseases and provide a significant step forward in the development of multivalent vaccines targeting multiple pathogens in resource-limited settings.

Abstract ABSTRACT ID: 035908

FABRICATED (BIOPATCH-D): AN INNOVATIVE BIOENGINEERED WOUND DRESSING MATERIAL

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A wound dressing serves as a protective barrier designed to safeguard the wound by absorbing exudate, maintaining optimal moisture levels, and promoting tissue regeneration. Most FDA-approved products available on the market are made of hydrocolloids, proteins, collagen, and hydrogels. However, despite their benefits, currently used synthetic dressings have significant limitations. Our research focuses on developing an innovative bioengineered wound dressing material ladled as Biopatch**-D**, which comprises two main components:

1. Bioactive Dual-Layered Healing Patch:

This patch is made from a biodegradable, non-antigenic gelatine polymer blended with small amounts of chitosan to harness its hemostatic properties. This mixture is cast onto a biocompatible, hydrophilic polyvinyl alcohol (PVA) polymer to form a highly porous biomaterial scaffold. A bioactive suspension containing a cocktail of wound-healing promoters is integrated into the composite to enhance its wound healing properties.

***2.* Biodegradable & Eco-friendly Dressing Material**:

The base of Biopatch-D consists of a fusion of silver nanoparticles and cellulose nanofibers, providing a biocompatible and environmentally sustainable substrate for wound coverage.

This combination aims to create a good-fill ecosystem with enhanced therapeutic capabilities. A range of physicochemical and biochemical studies, including SEM imaging, FTIR spectrum analysis, cell morphology analysis, swelling studies, blood absorption studies, cell viability assays, regeneration studies, and microbial assays, ensure infection control and support healing. This innovative material holds the promise of improving patient outcomes, accelerating healing, and offering comprehensive wound management.

ABSTRACT ID: 055635

YOGA-MUSIC INTERVENTION FOR PHYSICAL, MENTAL WELLBEING AND OVERALL LITERACY OF SCHOOL GOING POPULATION OF WEST BENGAL: AN EEG STUDY

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In the context of present day education policies, the importance of music, dance, drama combined with yogic techniques in enhancement of overall learning and wellbeing of an individual student is well established. The present study intends to prescribe a combined yoga-music based protocol for school students, backed by neuro-scientific research which will be beneficial not only for the overall literacy of the students but also for their psycho-physiological well being. Two groups of 5 school going students each belonging to West Bengal, India, were prepared - one control and one experimental. All the students belonged to the same age-group of 14-16 years and other homogeneity parameters were maintained for preparing the groups. A 25 min protocol was prescribed which includes a combination of instrumental relaxation music followed by breathing practices, *pranayama*, relaxation and meditation techniques. Prior to and after the experiment, both the groups were subjected to the Revised Child Anxiety and Depression Scale (RCADS), which is a 47-item, youth self-report questionnaire with several subscales such as separation anxiety disorder, panic disorder, low mood (major depressive disorder) etc. Electroencephalography (EEG) was conducted while the participants underwent the yoga-music combined protocol. Different EEG parameters like stress, attention, cognitive load were calculated and the variations were noted during the progress of the protocol. The variation of alpha and theta spectral power corresponding to frontal, occipital and parietal lobes were noted during and after the protocol to assess quantitatively the beneficial effects of the same. The psychological assessment obtained from RCADS inventory seems to corroborate with the decrease in alpha and theta spectral values under the effect of yoga-music protocol. The stress and attention related parameters obtained from EEG signals also show positive impacts. This is a pilot study and a pioneering one in the state, this is being continued to understand the long-term benefits which can be obtained from the developed protocol and can be used as an alternative form of intervention alongside conventional methods.

Keywords: EEG, Literacy rate. Music-meditation protocol, Cognitive load, Alpha and Theta Power, ANOVA

ABSTRACT ID: 070052

PREMENSTRUAL SYNDROME AND STATE-TRAIT ANXIETY INVENTORY (STAI-S AND STAI-T): THE INTERRELATIONSHIP

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Background: Premenstrual Syndrome (PMS) is a condition characterized by a set of physical and psychological symptoms that usually appear in the luteal phase of the menstrual cycle. The more severe variant of PMS is known as premenstrual dysphoric disorder (PMDD), and it is mainly associated with psychological disorders.

Aims and Objectives: Based on prior research articles, the present study aims to determine the relationship between the PMS, PMDD, and State-Trait Anxiety Inventory (STAI-S and STAI-T) among young adult women in West Bengal, India.

Methodology: 100 female college and university students aged between 18 and 25 (mean±sd: 21.5±4.94) were selected for the survey. The students were asked to fill out a Google form consisting of informed consent, STAI-S, STAI-T, and premenstrual symptoms screening tool (PSST) and submit it to the interviewer. The responses received were classified as individuals having a normal menstrual cycle, women suffering from PMS, and females affected by PMDD. The data were analyzed in R software.

Results: The statistical analysis indicated a strong positive association between PMS, PMDD, and the State-Trait Anxiety Inventory (STAI-S; p-value: 0.027 and STAI-T; p-value: 7.472e-05). Furthermore, as the severity of PMS or PMDD increased, the psychological conditions of female students deviated rapidly.

Conclusion: The current study revealed a positive interrelationship between PMS and/or PMDD with STAI-S and STAI-T which corresponds with previous research studies.

ABSTRACT ID : 014933

ELUCIDATING THE ROLE OF PFKFB3-DRIVEN GLYCOLYSIS IN METASTATIC PROSTATE CANCER PROGRESSION

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Prostate cancer (PCa) is the second most common cancer in men worldwide and resistance to conventional hormone therapy at the advanced stage of the disease makes the prognosis worse. Metastatic cells are very stringent and depend largely on glycolysis to survive in the changing TME. Moreover, PFKFB3 (6-phosphofructo-2-kinase/fructose-2,6-biphosphatase 3), a bifunctional key enzyme that plays a major regulatory role in glycolysis. Therefore, targeting a molecule that can influence both glycolysis and metastatic progression of the cancer cells becomes the immediate requirement. To support our hypothesis, we first employed DAVID and KEGG pathway enrichment analysis on the DEGs derived from the data of the primary and metastatic samples of PCa deposited online in GEO NCBI and identified PFKFB3 to be the hub gene. Later, using Patient-Derived Xenografts models of PCa available in cBioportal, we determined that PFKFB3 is highly upregulated in metastatic PCa samples as compared to the primary. Furthermore, we used PC3 and DU145- the two metastatic PCa cell lines, and showed that PFK-158, a potent PFKFB3 inhibitor leads to a dose-dependent decrease in glucose uptake, cell proliferation, and colony formation ability of the PCa cells. Importantly, PFKFB3 inhibition also showed a significant decline in the migration potential and survival of the two cell lines. These results thus implicate that PFKFB3, an important glycolytic regulator influencing the altered glucose metabolism of the PCa, can also act as a potential therapeutic target for the metastatic PCa.

ABSTRACT ID: 041642

DEPRESSION AND SELF-ESTEEM ARE ASSOCIATED WITH BODY IMAGE PERCEPTION AND EATING ATTITUDES: A STUDY ON URBAN ADOLESCENT GIRLS

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Weight concerns and eating disturbances are the global phenomena affecting adolescent girls in developed as well as developing countries. India is no exception to this, where food choices among adolescents have been changed drastically as a result of modernization. The study aims to understand the relationship of level of depression and self-esteem with body image perception and eating attitudes among urban adolescent girls.

The present study included 1814 girls aged 14-19 years of twin cities of Kolkata and Howrah, West Bengal, India. Data were collected on socio-demographic profile, body image perception, eating attitudes and psychosocial health (level of depression and self-esteem).

Nearly half of the girls from higher socio-economic group who aspired to reduce weight reported moderate to severe depression with low to moderate self-esteem. Girls with disordered eating attitudes irrespective of socio-economic status, showed low to moderate self-esteem more than girls with normal eating attitudes. Results of two way analyses of variance show that socio-economic status and body image perception independently had significant effect on level of depression. On the other hand, level of self-esteem was significantly influenced by body image perception but not by socio-economic status. Eating attitudes independently had significant effect on depression and self-esteem.

It is concluded that urban girls, who had strong desire for weight loss as well as weight gain, were found with high levels of depression and low self-esteem. Disordered eating attitudes showed positive association with level of depression and inverse association with self-esteem, across socio-economic status.

Abstract ID: 0149144

UNDERSTANDING THE VULNERABILITY OF FERROPTOSIS ON SUBJECT OF BREAST CANCER SUBTYPE

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Breast cancer is one of the leading causes of cancer related mortalities in females with different subtypes of the disease. The development of drug-resistance within the breast cancer cells is the core of early relapse and poor prognosis of the disease. Breast cancer with diverse subtypes like Luminal A, Luminal B, HER+, and Triple-Negative Breast Cancer (TNBC), has varied outcomes toward distinct cell death-inducing drug-based therapies. However, ferroptosis, a regulated form of cell death, which is non-apoptotic in nature, has significant clinical values towards anti-cancer therapies. Therefore, investigating the vulnerability of ferroptosis with respect to different subtypes is hoped for a better understanding in anti-breast cancer therapies, especially for the most common, the Luminal A subtype and the most aggressive, TNBC subtype. Hence, we examined the susceptibility of both TNBC and Luminal A type breast cancer cell lines to ferroptosis induction. Here, interestingly our findings suggest a higher sensitivity of the TNBC cells towards ferroptosis induction than Luminal A type. This outcome refers to an unusual attribute of breast cancer that the non-aggressive form resists more than the aggressive and most therapy insensitive one, and consequently brings up unexplored concepts in case of breast cancer carcinogenesis, which is the subsequent focus of our study.

HIGH INTENSITY EXERCISE INDUCED CHANGES IN OXIDATIVE STRESS AND SKELETAL MUSCLE DAMAGE IN MALE ENDURANCE AND RESISTANCE TRAINED ATHLETES: A COMPARATIVE STUDY

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High intensity exercise leads to skeletal and cardiac muscle damage and oxidative stress not only in sedentary individuals but also in athletes. Male resistance (RA, N=18) and endurance trained athletes (EA, N= 18) belonging to 20-30 years of age were recruited in the study from various sports academies of Kolkata to evaluate and compare their oxidative stress level and muscle damage parameters following high intensity exercise. The data were also compared with their sedentary counterparts (N=30). Familiarization trial was performed to identify the speed and inclination in which the subject attained 80% of his HR_{max}. Fasting blood sample was collected and instructed to continue the exercise at 80% HR_{max} until volitional exhaustion. Blood samples were again collected immediately after and 48 hours after the exercise trial. Skeletal muscle damage markers (CPK, LDH, AST, ALT, CRP) and oxidative stress markers (SOD, CAT, LPO, total thiol) showed significant difference of immediately after and 48 hours after exercise values with the pre-exercise value in all the groups which in turn showed significant difference between after exercise and 48 hours after exercise. Values of SC showed significant difference in (AST, ALT and LPO) with the athletic groups at all time points. All studied parameters remained elevated even after 48 hours of exercise indicating incomplete recovery following the exercise trial. It is concluded from the study that different training programs do not affect the high intensity exercise induced oxidative stress and muscle damage which are significantly higher in sedentary control subjects than the trained persons.

ABSTRACT ID: 054004

GENETIC ASSOCIATIONS BETWEEN VITAMIN D RECEPTOR POLYMORPHISMS AND VITAMIN D LEVELS IN PARKINSON'S DISEASE: INSIGHTS FROM RFLP ANALYSIS

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Background : Parkinson's disease (PD), the second most common neurodegenerative disease affecting majorly the geriatric population, is often treated symptomatically. PD patho-etiology involves deformed α-synuclein, mitochondrial dysfunction, and oxidative stress. Recent reports indicate connections between PD and inflammation. Neuro-steroid Vitamin D (VD) binds with Vitamin D receptor (VDR) to perform various brain functions including neuroprotection, improved neurotransmission, dopaminergic neuronal activity, decreasing oxidative stress and regulation of inflammation. Single nucleotide polymorphisms in the *VDR* may induce hypovitaminosis D, affecting VD functioning in brain, contributing as one of the causative factors of PD.

Aim : To investigate genetic associations between *FokI* and *BsmI* polymorphisms in *VDR* gene and PD encompassing vitamin-D levels, in a well-characterised cohort of West Bengal, India.

Methods : 30 PD patients (MoCA d”23; H&Ye”4) and 20 healthy controls were recruited for this case-control study. Saliva and buccal-swab samples were collected for conducting ELISA, Polymerase-Chain Reaction, and Restriction-Fragment-Length-Polymorphism (PCR-RFLP) respectively. SPSS (IBM Corp., version-20) was used for data analysis.

Result : 66.66% of the PD population showed *FokI* and *BsmI* polymorphisms whereas among healthy controls, 35% had *FokI* and 40% had *BsmI* polymorphisms. The genotypes showed significant association. 71.4% of PD patients showed VDD. *BsmI* polymorphism was found to have significant correlation with PD severity.

Conclusion : This study unravels *VDR* as a potential gene of interest in PD with *VDR*-polymorphisms playing key genomic event regulating VD thus, paving the way for proband-specific non-invasive diagnosis for therapeutics and preventive measures. This profiling would be a promising directive towards tailored VD supplementation in PD management.

PAIN TO PLEASURE BY RUTIN: ANTI-NOCICEPTIVE AND ANTI-INFLAMMATORY ACTION OF RUTIN IN FORMALIN INDUCED ACUTE MURINE PAIN MODEL

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Background: This study explores the potential of Rutin, a plant-derived flavonoid composed of quercetin and rutinose, as a promising and safe option for managing acute pain.

Aims: To study the anti-inflammatory and anti-nociceptive properties of rutin in a formalin induced acute pain model.

Methods: Anti-hyperalgesic behaviours by tail flick, hot plate and nociceptive behavior by paw licking events were measured. Spontaneous locomotion and anxiety were observed by open field and elevated plus maze tests respectively. Formalin induced neurogenic inflammation was assessed by Substance P, CGRP, NK1R, p65 and pAkt in paw tissue. Alterations in glutamate, and GABA were evaluated in the spinal cord. Animal experiments were performed after IAEC approval.

Results and Discussion: In both prophylactic and therapeutic strategy with rutin demonstrated significant analgesic effect. Rutin treatment increased the paw withdrawal and tail flick latency by **3x** and **2.8x** respectively. It also restricted the paw licking event by **0.3x**. Rutin therapy significantly **($p<0.001$)** restored the restricted movement and high anxiety that formalin caused. It also significantly reduced neurogenic inflammation on local basis as observed by Substance P, CGRP, NK1R, p65 **($p<0.01$)**. Cell survival marker pAkt expression in paw was significantly upregulated in rutin treatment **($p<0.01$)**. Rutin downregulated excitatory neurotransmitter glutamate by **0.6x** at the spinal level as follow-up to its overexpression. The novel treatment restored the level of decreased GABA by **1.5x**.

Conclusion: Rutin was effective as both preventive and therapeutic agent against formalin-induced acute pain in mouse model.

ABSTRACT ID: 045137

PACLITAXEL SENSITIZES TUMOR NECROSIS FACTOR-RELATED APOPTOSIS-INDUCING LIGAND (TRAIL) RESISTANT BREAST CANCER CELLS TOWARDS RHTRAIL MEDIATED APOPTOSIS

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TRAIL ligand is known to activate apoptosis via death receptors (DR4 and DR5) and inhibit apoptosis via decoy receptors (DCR1 and DCR2). These decoy receptors, particularly DCR2, are involved in generation of TRAIL resistance in many types of cancer. Combinatorial administration of small molecule ligands along with TRAIL can be an effective preclinical approach to reverse TRAIL resistance. In this work, we investigated the possibility that pretreatment of paclitaxel may promote apoptosis in TRAIL resistant breast cancer cells. *In silico* analysis was done to investigate the probable binding stability between TRAIL receptors and paclitaxel via docking and MD simulation. qPCR and immunoblot was done to assess the ability of paclitaxel to modulate the expression of DR5 and DCR2 at the transcript and protein level. Next, paclitaxel was pre-administered to TRAIL-resistant human breast cancer cells followed by recombinant human TRAIL (rhTRAIL) treatment to check whether pretreatment of paclitaxel can reverse TRAIL resistance. *In silico* analysis showed that paclitaxel can bind with higher stability to DCR2 in comparison to DR5. Next, in cell line experiments we observed that administering a non-lethal dose of paclitaxel led to an increase in DR5 and a decrease in DCR2 expression. Furthermore, in TRAIL- resistant MCF7 and MDA-MB-453 cells, pre-treatment with paclitaxel followed by rhTRAIL administration induced significant cell line. We conclude that paclitaxel increased the expression of DR5 as well as decreased DCR2 expression thereby sensitizing TRAIL resistant cells to rhTRAIL mediated apoptosis. Thus, our study uncovers a novel therapeutic strategy to overcome TRAIL resistance.

ABSTRACT ID: 023358

MOLECULAR SCREENING OF POLYCYCLIC AROMATIC HYDROCARBONS FOR AHR AFFINITY IN THE XENOBIOTIC PATHWAY AND EVALUATING ITS' DOWNSTREAM EFFECT ON LUNG CANCER PROGRESSION.

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Introduction- Polycyclic Aromatic Hydrocarbons (PAH) are one of the most prominent air pollutants. AhR is a prominent protein which acts as one of the prime mediators of the xenobiotic pathway. There are very few literatures which screened the 16 molecules to analyze their affinity towards AhR. Thus putting light in this field could further explain how this specific PAH compounds alters AhR mediated xenobiotic pathway and explain its effect on inflammation and cancer.

Methods - Molecular modeling of AhR protein was done for the first time using Schrodinger. We have screened the 16 PAH molecules and shortlisted the one which has the highest affinity for AhR using molecular docking and molecular dynamics simulation. Further wet lab techniques were used to assess the effect of the PAH molecule on various cellular processes like cell proliferation and cell migration. AhR protein expression levels and EMT markers like E-cadherin and Vimentin expressions were checked using immune-florescence and immune-blotting.

Results- Molecular screening of PAH compounds using computational methods revealed Indeno[1,2,3-cd]pyrene (IDP) has the highest affinity towards AhR. IDP treatment in various concentrations enhances the cell migration, cell proliferation and the EMT marker expressions. Immunofluorescence analysis revealed elevated AhR expression with IDP treatment in increasing concentration.

Conclusion- Increasing air pollution and elevated levels of PAH results in an alarming situation of rising lung inflammation and lung cancer. Our study revealed that IDP has the highest affinity for AhR and its treatment increases the AhR protein levels in the cells and ultimately results in cancer progression.

ABSTRACT ID: 113803

VITAMIN D DEFICIENCY AND POLYCYSTIC OVARY SYNDROME : UNLOCKING MULTIFACETED INTRICACY

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Background: Polycystic-ovarian syndrome (PCOS), a heterogeneous endocrinopathy, is prevalently causing infertility in reproductive-aged women and cardio-metabolic disease in later life. An emerging epigenetic regulator of this polygenetic disease is vitamin-D deficiency/insufficiency (VDD/VDI).
Aim: To explore how VDD/VDI-associated metabo-endocrinopathy affects PCOS symptoms in West Bengali ethnic groups.

Methods: From March 2022 to March 2024, 700 PCOS patients (ages 18–28 years) and 200 age, gender, and ethnicity-matched healthy controls (HC) participated in this case-control study. A structured questionnaire, bioelectrical impedance analyser, hormonal assay, and PCR-RFLP were used to look at menstrual problems, obesity indices, endocrine profile, and vitamin-D receptor SNPs. Data was analysed using SPSS-20.

Results: The PCOS group had considerably lower VD levels than HC ($P < 0.01$). 90% of PCOS patients with inadequate VD had menstrual abnormalities and 70% had faced infertility complications. VDR-FokI polymorphism was found in 89% of PCOS patients relative to 64% of HC. VD was inversely correlated with hyperandrogenic (testosterone, DHEAS, LH-to-FSH ratio) ($P < 0.05$) and metabolic (insulin resistance, $P > 0.05$) parameters. Infertile PCOS patients with VD deficiency reported greater AMH levels compared to those with sufficient VD ($P < 0.05$). VD was also inversely correlated with the inflammatory marker CRP ($P > 0.05$). Acanthosis nigricans was the most common cutaneous manifestation in VD-deficient PCOS individuals (80.89%), followed by alopecia (77.28%), hirsutism (73.33%), and acne (66.67%). Additionally, the case group had higher visceral fat and poorer skeletal muscle mass than HC ($P < 0.01$).

Conclusion: VDD/VDI plays a pivotal role in PCOS manifestations.

ABSTRACT ID: 050413

SERUM NEUROFILAMENT LIGHT CHAIN AND BRAIN MORPHOMETRY IN PATIENTS WITH PROGRESSIVE SUPRANUCLEAR PALSY

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Background: Blood biomarkers may advance our understanding of the pathogenesis in progressive supranuclear palsy (PSP). Neurofilament light chain (NfL) is an emerging neurodegenerative biomarker in PSP.
Objectives: We aimed to determine if serum NfL levels are altered in PSP patients compared to healthy controls. We further studied the association of specific structural changes of different subcortical and cortical brain regions with serum NfL levels.
Methods: We recruited 11 PSP patients and 13 age-matched healthy controls. PSP rating scale was used to evaluate disease severity. Subjects underwent 3D T1 MPRAGE brain MRI scans. Neuromorphometry was performed using Freesurfer neuroimaging software. Total 5 ml blood was collected for serum isolation. ELISA for NfL levels were measured.
Results: In PSP, NfL levels increased significantly ($p = 0.0001$) compared to healthy and correlated with disease severity ($p = 0.014$). NfL levels correlated with the left rostral anterior cingulate volume ($p = 0.007$) and surface area ($p = 0.035$), left transverse temporal surface area ($p = 0.016$), and left superior parietal and right supramarginal curvature.
Conclusions: PSP patients had higher NfL levels that correlated with disease severity and brain structural abnormalities. The findings suggest that neuromorphometric measures combined with blood NfL level may assist in early detection of PSP.

ABSTRACT ID : 083648

QUANTITATIVE MRI AND 18F-FDG PET ANALYSIS IN EPILEPSY PATIENTS: AN INTEGRATED NEUROIMAGING APPROACH

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Epilepsy is a prevalent neurological disorder that affects millions globally, including a significant number in India. Characterized by recurrent seizures, epilepsy profoundly impacts the quality of life, necessitating improved diagnostic and treatment strategies. This study presents a novel, integrated approach combining structural Magnetic Resonance Imaging (MRI) and functional 18F-FDG PET imaging technique to analyze brain abnormalities in epilepsy patients. Utilizing the FreeSurfer software suite, the study leverages advanced automated segmentation and parcellation tools to obtain precise volumetric measurements of cortical and subcortical structures, correlating these findings with regional glucose metabolism alterations. MRI provides detailed high-resolution structural maps of the brain, capturing morphological changes, while 18F-FDG PET data are co-registered to the MRI space to generate voxel-wise metabolic maps. These maps reveal areas of hypometabolism, which are commonly associated with seizure foci. Integrating structural and metabolic data offers a synergistic view, enhancing sensitivity and specificity in identifying epileptogenic zones. This multimodal approach allows for a more nuanced understanding of the disease's pathophysiology, which could be pivotal for refining diagnostic accuracy and guiding treatment planning, particularly in surgical candidates, providing reassurance about the precision of the method. By applying this method to real-life patient data, the study underscores the potential for improving clinical outcomes through precise localization of epileptogenic regions. The findings have global and regional relevance, offering a framework for the improved management of epilepsy in both Indian and international contexts. Further validation may establish this approach as a standard in clinical neuroimaging for epilepsy.

ABSTRACT ID: 093623

CHARACTERIZATION OF SMALL AIRWAY DISEASE IN ILD: DIAGNOSTIC INSIGHTS FROM IMPULSE OSCILLOMETRY

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Background:

Airflow obstruction, commonly observed in interstitial lung disease (ILD), when imparted by small airways is marked as "small airway disease in ILD" (SAD-ILD). It remains effectively diagnosed using a forced expiratory flow (FEF25-75) cut-off. This study aimed to compare SAD-ILD and ILD without small airway obstruction (unmixed ILD) using spirometry, impulse oscillometry and post-exercise recovery response in 2-chair test.

Methods:

Consecutive patients with ILD underwent spirometry and impulse oscillometry concurrently with 2-chair test. SAD-ILD was identified using a FEF_{25-75}cut-off of <41.5% predicted as revealed earlier. Spirometric (FVC, FEV1, FEV1/FVC and FEF_{25-75}) and Impulse oscillometric[RESISTANCE (R5, R10, R15, R20, R5-10, R5-15, R10-15, R5-20) and reactance [Xin5 (inspiratory), Xex5 (expiratory), AX (area of reactance), Fres (resonant frequency), and derived variables such as Xin5/Xex5 and (Xin5–Xex5)/Xex5] parameters were considered for statistical analysis.Maximum desaturation (Desat-max) in 2-chair test was also included in the assessment.

Results:

The SAD-ILD group (n=20) had significantly lower FEV1/FVC ratios compared to the unmixed ILD group (n=69) [0.67 ± 0.12 vs. 0.86 ± 0.05, p<0.001], and higher expiratory reactance at 5Hz (Xex5) [-5.175 ± 3.61 vs. -1.876 ± 1.21, p<0.0001]. The derived variable (Xin5–Xex5)/Xex5 also showed a significant difference between the groups [-4.26 ± 27.78 vs. 9.323 ± 44.20, p=0.012]. No significant differences were observed in resistance (R5, R10, R15, R20), resonant frequency (Fres), or desaturation during the 2-chair test.

Conclusion:

SAD-ILD can be distinguished from unmixed ILD both by FEF25-75 and impulse oscillometry.

ABSTRACT ID: 013258

METHYL GLYOXAL MEDIATED GLYCATION CAUSES AMYLOIDOGENIC AGGREGATION OF BSA – INSIGHTS INTO THE DIABETIC CONNECTION OF NEURODEGENERATIVE DISORDERS

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Methyl glyoxal (MGO) is the most abundant glycolytic byproduct and a highly reactive dicarbonyl compound. In the present studies, the structural changes inflicted by the attachment of MGA to the bovine form of serum albumin, an abundant serum transporter protein, was investigated over a two-week period. MGO mediated formation of glycated adduct was confirmed by characteristic AGE (Advanced Glycated End Product) fluorescence observed from 3rd day onwards. Intrinsic tryptophan fluorescence, ANS and Thioflavin T binding showed that MGO attachment increased the aggregation propensity of BSA with Thio T positive amyloidogenic transition. Both AGE fgluoresecnce These BSA-MGO adducts were substantially bigger in size as confirmed by Dynamic Light Scattering as well as Native PAGE. In order to further investigate the basis of this amyloidogenic transition, CD spectra of the glycated adducts were acquired. A gradual but clear transition of alpha helix to beta pleated sheet was observed with increasing window of glycation. The studies collectively aimed towards the cellular consequences of accumulation o[f AGE adducts and thus provided significant insights towards understanding the molecular basis of glycation mediated amyloid formation.

ABSTRACT ID : 124943

FITNESS PROFILE OF ONLINE DELIVERY EXECUTIVES OF KOLKATA, WEST BENGAL

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The present day stress-stricken lifestyle has made us more reliant on the concept of online delivery by virtue of the strenuous efforts put in by the online delivery executives. The present study was aimed to evaluate the fitness profile parameters of online delivery executives. 118 online delivery executives [food delivery executives (FDE, n=44), goods delivery executives (DE, n=43) and rapid delivery executives (RDE, n=31)] were recruited in the study. Sedentary employees (CG, n=41) were also recruited as controls. Aerobic capacity (VO_{2max}), anaerobic power, handgrip strength, handgrip endurance, agility, flexibility, reaction time, vertical jump test (VJT) and balance score were evaluated by standard methods. ANOVA followed by Bonferroni's post-hoc analysis was adopted for statistical treatment of data. Level of significance was set at $p<0.05$. Body weight, body mass index (BMI), blood pressure, resting heart rate, anaerobic power and agility were significantly higher in CG. VO_{2max}, handgrip strength, handgrip endurance, flexibility, VJT and balance score were significantly higher in the experimental groups. In terms of handgrip strength and flexibility, significant differences were also observed among the experimental groups. However, reaction time did not show any significant difference between the groups. It is concluded from the present study that online delivery executives have better fitness status than their sedentary control counterparts.

ABSTRACT ID: 052836

DISSECTING THE SPIROMETRIC BRONCHODILATOR REVERSIBILITY OF 'UNCLASSIFIED' OBSTRUCTIVE AIRWAY DISEASE (OAD) PATIENTS

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Background: Spirometric diagnosis of obstructive airway disease (OAD) not satisfying the definition of asthma or COPD needs elaboration.

Methods: Symptomatic subjects with the categorical clinical diagnosis of OAD (excluding bronchiectasis) were subjected to spirometry with serial salbutamol and glycopyrronium responsiveness measurements. Those that do not belong to asthma (FEV1 reversibility e"200 ml and 12%) or COPD (FEV1/FVC d"0.7 and FEV1 reversibility d"200 ml and </> 12%) were marked "unclassified". They were divided into five sub-groups on salbutamol-reversibility as a) <12% and <200 ml, b)>12% and <200 ml, c) <12% and e"200 ml, with FEV1/FVCe"0,7 and as d) e"12% and <200 ml, and e) 12% and e"200 ml with FEV1/FVC d"0.7 respectively.

Results: The unclassified group holds 610 (38.6%) of 1580 inclusions. They fall between asthma and COPD as regards their age and BMI. The group 'a', 'b', 'c', 'd', and 'e' consisted of 324 (53.11%), 22 (3.61%), 54 (8.85%), 204 (33.44%), and 6 (0.99%) patients respectively. The overall salbutamol and glycopyrronium reversibility were independently significant (P<0.0001) with113.3 ± 96.18 and45.43 ± 97.82 ml. There was universal but variable glycopyrronium reversibility across the groups [group-b: 13.6 to group-e: 33.3%] while salbutamol reversibility is observed in some and absent in others. The combined reversibility is above 100 ml for all the groups suggesting that combination therapy might be helpful for these patients.

Conclusion: The 'unclassified' OAD forms a formidable bulk of OAD patients and demands attention for recognition, categorization, strategy for evaluation, and treatment recommendation.

INVESTIGATION OF TRAIL-INDUCED RNA SPLICING IN BREAST CANCER CELLS

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Tumor Necrosis Factor Related Apoptosis Inducing Ligand (TRAIL) is a cytokine that is expressed by the immune cells. It can activate caspase-mediated apoptotic pathway in its target cells (cancer cells) with minimal effects on normal cells. However, its effect on RNA splicing remains unexplored. Therefore, our study explored the effect of TRAIL on RNA splicing landscape in MDA-MB-231 breast cancer cells focusing on differential 'skipped exon' events. RNA sequencing was performed on TRAIL-treated MDA-MB-231 cells using Illumina Hi-seq platform followed by differential gene expression and Gene Ontology (GO) Enrichment analysis through DAVID. GO:0006364-'rRNA processing' was found to be significantly enriched in TRAIL treated cells (P=5.27E-05; fold enrichment=5.195). This included genes SUV39H and GEMIN4 which are known to be involved in splicing. Next, RPKM values were analysed to evaluate the splicing events after TRAIL treatment. On analysing control versus experimental samples, we observed 167 genes to be differentially spliced showing 212 skipped exon events. Further analysis through CytoscapeCytoHubba software identified FANCM (Fanconi anaemia complementation group protein M) as a hub gene with highest MCC score of 10. FANCM is a DNA damage repair gene. Analysis of FANCM sashimi plot revealed altered splicing of FANCM, with exon retention in control cells (NM_020937.4) and exon skipping (NM_001308133.2) under TRAIL treatment. In conclusion, we can hypothesize that TRAIL induces global splicing changes in breast cancer cells, particularly in FANCM.

ABSTRACT ID:113506

INTERFERON-γ AND TUMOR NECROSIS FACTOR-α INDUCES CELLULAR REDOX BALANCE DISRUPTION AND APOPTOSIS IN OSTEOSARCOMA CELLS.

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Resistance to cell death is a defining characteristic of cancer. Given the immune system's ability to recognize and eliminate cancer cells, immunotherapy of cancers using mono-cytokine therapy have been practiced for couple of decades with mixed results. The therapy depends on cytokines and the cytotoxic actions of immune effector cells to overcome cancer's resistance to cell death. However, the exact cytokines that can trigger tumor cell death and the pathways linking these cytokines to cell death across different cancer types are still unclear. Very recently, combination of two pro-inflammatory cytokines IFNγ and TNFα has been shown to have cytotoxic effects on colon cancer cells. However, what other cancer cells are susceptible to the IFNγ and TNFα-mediated cell death is not known. We explore the effect of IFNγ and TNFα on the survival outcome of cancer patients using the pan-cancer genome atlas (TCGA) and other known cancer transcriptome databases. Our analysis reveals that Sarcoma and a few more cancer types showed a statistically significant survival increase in high IFNγ and TNFα expression patient cohorts where Sarcoma showed the most promising results. Using the MTT, PI and Clonogenic assay we determine that osteosarcoma cells can be effectively killed by IFNγ and TNFα. Mechanistic study with the osteosarcoma cells show that the cytokines induced STAT1 signaling, generation of redox imbalance leads to Caspase 3 and 7 mediated cleavage of GSDME that leads to cell death. Our result shows the promise of effective combined cytokine therapy in osteosarcoma.

ASSESSMENT OF FLEXIBILITY INDEX AMONG INDIAN POSTAL WORKERS

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Indian postal workers have become the backbone of the country's communication and they have played a decisive role in the social economic development of India. Human flexibility status and level of discomfort and pain are strongly correlated. Lower flexibility in back and hamstring area cause higher indication of back and leg pain. The purpose of this experimental epidemiological study was to elaborate the degree of flexibility of back and hamstring muscle among postal workers of India. After considering the inclusion and exclusion criteria, randomly selected sixty postal workers of Kolkata had been assessed using non-invasive tests like Straight Leg Raise test (SLR) and V Sit and Reach test (VSR). Every age group irrespective of gender had occurrence of positive SLR. Three out five participants whose age ranging between 36-45 years had sensation of pain during straight leg raise test. Among this age group, only 40% male postmen could score "good" in VSR test. From this study it can be concluded that experiments on flexibility tests results are supporting the occurrences and prevalence of musculoskeletal discomforts and pain among Indian postal workers.

ABSTRACT ID: 084233

VISIONARY INSIGHTS INTO HEMATOLOGICAL AND BIOCHEMICAL BIOMARKERS OF DIABETIC RETINOPATHY: AN INTROSPECTIVE STUDY FROM EASTERN INDIA

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Diabetic retinopathy (DR) is a major ocular complication of diabetes mellitus that can lead to blindness if untreated. This study aimed to evaluate hematological and biochemical parameters in DR patients compared to age-matched non-diabetic (ND) and diabetic without retinopathy (D) subjects, investigating their potential association with DR progression. A total of 60 individuals (N=60) were recruited across the three groups following ethical clearance.

Blood samples were analyzed for hematological, biochemical, and pro-inflammatory markers using automated analyzers, ELISA, real-time PCR, and immunoblotting. Significant ($p<0.05$) differences were observed between groups. In DR patients, hemoglobin (Hb%), packed cell volume (PCV), total leukocyte count (TLC), cholesterol, LDL, triglycerides, and creatinine levels were reduced, while urea, HDL, platelet count, and erythrocyte levels were elevated. Reactive oxygen species (ROS), mitochondrial ROS, and lipid peroxidation (TBARS) increased, whereas antioxidant enzyme activities (SOD, catalase) decreased in DR patients.

Serum glutamate, serotonin, and dopamine levels were elevated, while GABA levels were decreased in the DR group. Additionally, downregulation of GLUT-1 and GLUT-4 in red blood cells and upregulation of pro-inflammatory cytokines (TNF-α, IL-6, IL-1β, VEGF, IL-2R, IFN-γ), cell adhesion molecules (ICAM-1, VCAM-1, integrins), and NF-κB were noted.

The study suggests that alterations in these biomarkers are associated with the progression of DR and offers insights into potential therapeutic targets to mitigate its effects.

ABSTRACT ID: 012807

AN IMPLEMENTATION RESEARCH ON DECISION MAKING AT 'JOB-ROTATION' FOR 'ONE EYED PERSON' DETECTED AT PERIODIC HEALTH CHECK UP IN A CHEMICAL FACTORY IN ORISSA, INDIA.

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Background:

Medical conditions which impair one's ability for certain work and compromises safety at work are important in context of Occupational Health. Such conditions detected at during periodic health check-up cause dilemma at considering 'job-rotation'. One such defect is 'one-eyed person'.

Objective:

Identification of medical conditions which impair one's ability for work and compromises safety and the factors which guide decision for 'job-rotation'

Creation of decision matrix to objectively guide at 'job-rotation'

Methods:

The medical conditions which impair one's ability for work and compromises safety were identified by retrospective chart review.

A decision matrix to objectively guide at 'job-rotation' was created by Delphi method.

Results:

Thirteen employees were one eyed as follows:

Section – Production:Support = 6:7,

Recruited as Physically handicapped – Yes:No:Data_NA = 2:3:8

Time of acquiring defect i.r.o recruitment – Before: After = 10:1

Depth perception needed for job - Yes:No = 2:11

Conclusion:

A medical condition that may impose difficulty in doing a job in general, but, if the individual has already made adaptations to overcome the condition and has been doing the job this should be considered.

However, if safety of (a) self, (b) fellow-workers and (c) premises is/are compromised 'job-rotation' has to be done.

At 'Job-rotation', 'pay-protection' and 'promotional-avenue' protection requires to be ensured.

ABSTRACT ID: 100201

COMPARATIVE MACROSCOPIC ASSESSMENT OF ASPHYXIAL DEATHS : INSIGHTS FROM HANGING AND STRANGULATION

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Background: Asphyxial fatalities caused by hanging or strangling are most commonly associated with neck lesions related to laryngohyoid fractures. The diagnostic relevance of these macroscopic findings in determining the manner of asphyxia remains unclear.

Methods: This observational cross-sectional study recruited asphyxial death cases from July'2022 to December'2023, due to hanging or strangulation. Cases were included based on autopsy findings, while decomposed or mutilated bodies and other types of asphyxia were excluded. The sample size was calculated using Solvin's formula, and statistical analyses were performed with GraphPad Prism software version 8.

Results: Among 100 cases, hanging was the most prevalent(n=83), followed by strangulation(n=9), partial hanging(n=5), and throttling(n=3). Abrasions were present in 26% of cases, with 69% didn't exhibit any. The knot position was predominantly over the left mastoid (56%), over the right mastoid (17%), and 7% over the occipital bone. Out of the hanging cases, 77% of the deceased exhibited a high up in their level of ligature material in hanging ones. Hanging victims exhibited greater prevalence of grooved ligature mark compared to strangulated ones (56% vs. 1%, $p<0.0001$), which was most prevalent (21.7%) among those aged 41-50 years ($p=0.91$). Abrasions were noted in hanging(19%) vs. strangulation(77%) cases ($p<0.0001$), with 59% of hanging victims displayed dry skin under the ligature while 37.5% displayed bruised skin in cases of strangling ($p < 0.0001$).

Conclusion: This study highlights the macroscopic differences in neck lesions between hanging and strangulation, despite both being asphyxial in nature, emphasizing its significance in determining the manner of death.