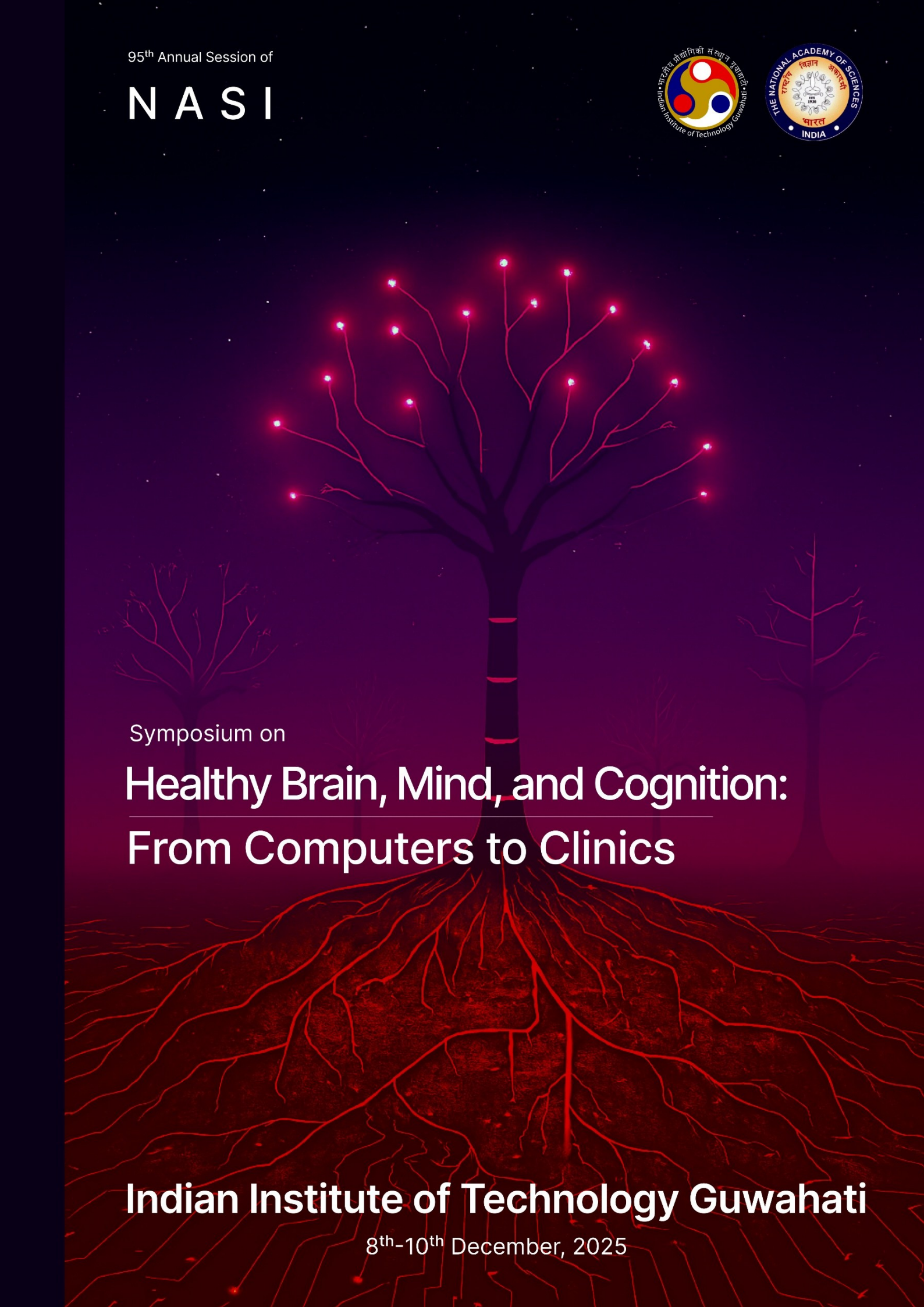
95th Annual Session of

NASI



Symposium on

Healthy Brain, Mind, and Cognition: From Computers to Clinics

Indian Institute of Technology Guwahati

8th-10th December, 2025


Indian
Institute
of
Technology
Guwahati

Annual Session
Abstract Book

December 8–10, 2025

Preface

"You, your joys and your sorrows, your memories and ambitions, your sense of personal identity and free will, are in fact no more than the behavior of a vast assembly of nerve cells and their associated molecules" – Francis Crick.

The 'human brain' has been one of the most intricate and captivating subjects of scientific inquiry. The quest to understand its functions continues to drive research across computer science, neuroscience, fundamental biology, physics, and several allied disciplines. Each field approaches mind, cognition, and intelligence through its own lens, collectively enriching our understanding and opening new avenues for interdisciplinary innovation.

The 95th Annual Session and Symposium of The National Academy of Sciences, India (NASI) explores this rich confluence through its theme, "Healthy Brain, Mind, and Cognition: From Computers to Clinics." The symposium seeks to illuminate the diverse aspects of brain health and cognition spanning neural structure and function, mental wellness, and their technological and clinical interfaces. Alongside, the Annual Session celebrates the remarkable breadth of scientific research across disciplines. In the domains of physical and biological sciences, a total of 203 abstracts has been selected for poster and oral presentations which will appear in this Abstract book. These contributions reflect the diversity, and aspirations of current scientific endeavors as well as the dedication of researchers nationwide to promoting basic knowledge and societal well-being.

NASI, with its long-standing vision of nurturing a knowledge-driven nation, continues to promote scientific excellence across India. The 95th Annual Session and Symposium, hosted in collaboration with IIT Guwahati, provides a vibrant platform for scholarly exchange and meaningful dialogue.

We extend our sincere appreciation to our sponsors, invited speakers, advisory committee members, authors, reviewers, participants, the organizing team, and volunteers, whose dedication and support have shaped this event into an enriching and collaborative experience.

Prof. Latha Rangan

Local Organizing Secretary

भारतीय प्रौद्योगिकी संस्थान गुवाहाटी
INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI

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प्रो. देवेन्द्र जालिहाल
Prof. Devendra Jalihal
निदेशक
Director

November 20, 2025

Director's Message

I extend a warm welcome to delegates of the 95th Annual Session and Symposium of The National Academy of Sciences, India (NASI), hosted here at IIT Guwahati. As a leading institute committed to interdisciplinary research and innovation, IIT Guwahati is proud to bring together a vibrant community of faculties, researchers, and students for this meaningful exchange of ideas.

The symposium, centered on "Healthy Brain, Mind, and Cognition: From Computers to Clinics," offers a platform for discussions on emerging ideas and approaches related to the brain and its interfaces with technology and society. Alongside, the Annual Session features oral and poster presentations from institutes across the country, showcasing the diverse research being carried out by scientists and students nationwide. Together, these segments create an environment for holistic sharing, learning, and collaboration leading to transformation of new age ideas.

My sincere appreciation goes to NASI, the organizing committee, invited speakers, sponsors, authors, reviewers, students, and volunteers whose dedication has made this event possible. Your efforts enrich the scientific community and strengthen the spirit of collaboration we value deeply at IIT Guwahati. I hope the discussions and interactions over the coming days inspire new ideas, partnerships, and continued progress.

Prof. Devendra Jalihal
Director, IIT Guwahati

राष्ट्रीय विज्ञान अकादमी,भारत
The National Academy of Sciences, India
A Scientific Professional Body under the Department of Science & Technology, Govt. of India

प्रोफेसर विनोद कुमार सिंह
Professor Vinod Kumar Singh
FNASc, FNA, FASc, FTWAS
अध्यक्ष **President**

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President's Message

It gives me immense pleasure to extend warm greetings and best wishes to all Fellows, Members, Delegates, invited speakers, and participants attending the 95th Annual Session of the Academy, hosted by IIT Guwahati. On behalf of the Academy, I would like to extend my heartfelt appreciation to the Director and the organising team for their gracious hospitality and meticulous arrangements, which made this scientific gathering a truly memorable one.

Since its inception in 1930, NASI has consistently pursued its mission of advancing science and promoting its application for national development and the betterment of human welfare. Over the years, the Academy has provided a platform for scientists to share knowledge, deliberate on emerging challenges, and contribute to policy and public understanding of science. NASI continues to play a key role in nurturing young talent, encouraging interdisciplinary research, and promoting public engagement in science and technology. Our various programmes are steps towards ensuring that the benefits of scientific progress reach every section of society.

The Annual Session reflects a culmination of these efforts, fostering collaboration and recognizing scientific excellence. The focal theme of the 95th Annual session- **"Healthy Brain, Mind and Cognition: From Computers to Clinics"** is timely and relevant. In an era where Artificial Intelligence (AI), computational neuroscience and medical technologies are rapidly converging, understanding the intricate functioning of the brain and its relationship with cognition and behaviours offers significant promise for improving health and overall quality of life.

I hope this gathering inspires our young scientists to pursue innovation with integrity and to align their work with the broader vision of a self-reliant and sustainable India. The key findings and recommendations emerging from these deliberations will be shared with the concerned Ministries and Agencies for their kind consideration.

I once again extend my gratitude to IIT Guwahati for hosting this session, and to Prof. Ashok Misra (Convener), Prof. Latha Rangan (Local Organizing Secretary), as well as all Fellows, Members, and participants, for their continued support to the Academy. May the discussions over the next three days yield new ideas, foster meaningful collaborations, and inspire initiatives that strengthen the Academy's mission and advance science for the benefit of society.

With best Wishes,

VKSingh

Vinod K Singh

November 20, 2025

THE NATIONAL ACADEMY OF SCIENCES, INDIA

(The Oldest Science Academy of India)

Organizes

95th Annual Session and Symposium on

Healthy Brain, Mind, and Cognition: From Computers to Clinics

Hosted by

Indian Institute of Technology Guwahati, Assam, India – 781039

Convener
Prof. Ashok Misra
Former Director, IIT Bombay
Past President, NASI
Email: ashokmisra47@gmail.com

Co-Conveners
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&
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Sectional President
(Biological Sciences)
Prof. Sanjeev Misra
VC, Atal Bihari Vajpayee Medical University, Lucknow
Email: misralko@gmail.com

Convener's Address

I feel privileged to be the Convener for the Symposium of the 95th Annual Session of the National Academy of Sciences, India (NASI), being held at the Indian Institute of Technology Guwahati. The Annual Session of NASI aims to bring together leading scientists, policy experts, industry professionals, educators, and students to discuss current scientific challenges and emerging opportunities. The thematic focus of the 95th Annual Symposium was chosen as **"Healthy Brain, Mind, and Cognition: From Computers to Clinics".**

Genesis of the Symposium – The brain is considered the "last frontier," given our limited understanding of its enormous complexity. Equally compelling is the quest to unravel the basis of the "mind" and "cognition". While it is known for ages that "there is no physical health without mental health", our experiences during the recent pandemic and the post-pandemic situation have reiterated this emphatically. In parallel, immense advances in computing technologies, data science and artificial intelligence have led to transformative progress in the field of brain, mind, and cognition. The more we know about the brain and mind, the better equipped we will be to ensure optimal mental health and handle its disorders. Hence, these advances in computational, data sciences and artificial intelligence, have immense translational potential in this background.

The sessions of this symposium will cover a wide range of cutting-edge topics focusing on brain networks, cognition, neurological & psychiatric disorders, therapeutics & physical systems by expert speakers that work in these domains (neuroscientists, engineers, clinicians & entrepreneurs). Furthermore, plenary talks by eminent leaders in the field will enlighten us on several important topics related to the symposium's thematic focus – namely, the role of academia in creating a Viksit Bharat, neuroscience and next-generation AI, and the future of health.

I am grateful to all the distinguished speakers who have accepted our invitation and contributed their expertise to this Symposium. My sincere thanks also go to my Co-Conveners, Prof. Venkatsubramanian Ganesan and Prof. Jayesh Bellare for putting together an excellent programme. I am thankful to Prof. Vinod K Singh, President, and the Council for their support and guidance. I am confident that the ideas emerging from these deliberations will contribute to advancing scientific understanding and creating pathways for future research and innovation.

(Ashok Misra)

Sectional President – Physical Sciences

Prof.Annapurni Subramaniam, FASc., FNASc.,
Vigyan Shri Awardee (2024)
INSA Woman Associate (IWA)
Director & Senior Professor
Indian Institute of Astrophysics, Bengaluru

Abstract - Astronomy from ground and space

Astronomical studies in pursuit of understanding our universe are being carried out using the ground as well as space based experiments. The Kodaikanal observatory recently completed 125 years of operation. There have been various international space missions that contributed to the multi-wavelength studies of various astrophysical phenomena in the past. India's first space observatory, AstroSat that has completed 10 years has made impactful science and has got significant attention in the international scene. In this talk, I will summarise the current and the future landscape of ground and space astronomy in the Indian and international scene. I will discuss the topical areas and science questions that are being prioritised internationally for the next decade, and how these can be accomplished by the planned projects/missions.

Sectional President – Biological Sciences

Prof. Sanjeev Misra
MS, MCh, FRCS (Eng.), FRCS (Glasgow),FICS, FACS (USA), FAMS, FNASc, DSc. (h.c)
Vice Chancellor, Atal Bihari Vajpayee Medical University, Lucknow, UP
Professor of Surgical Oncology
Former Director and CEO, All India Institute of Medical Sciences, Jodhpur, Rajasthan

Abstract - Nurturing Innovations in Healthcare in India

India's healthcare system is undergoing a transformative shift, driven by advancements in biotechnology, medical research, and digital health technologies. To effectively address the country's complex disease burden and healthcare disparities, it is imperative to strengthen innovation ecosystems within medical and research institutions. These institutions serve as critical hubs for translating scientific discoveries into practical, affordable, and sustainable healthcare solutions.

Strategic collaboration between premier medical and technological institutions are at the helm of these innovations. The AIIMS Jodhpur–IIT Jodhpur MedTech model exemplifies a translational framework that bridges clinical insight with engineering excellence to develop affordable, safe, and socially acceptable healthcare technologies. By integrating multidisciplinary expertise in medicine, biotechnology, and engineering, the model fosters an ecosystem where ideas originating in clinics are co-developed into deployable technologies within laboratories and incubators. The model also prepares the innovators for challenges and valleys of death of ideas.

This partnership nurtures young professionals, clinician-innovators, and biomedical engineers, equipping them with mentorship, infrastructure, and funding support to address unmet medical needs through low-cost, high-impact innovations. The collaborative MedTech Innovation and Entrepreneurship Center facilitates prototype development, regulatory guidance, and industry linkages, accelerating the journey from concept to clinical validation. Focus areas include medical devices, biosensors, diagnostics, rehabilitation technologies, and AI-driven health systems, aligned with India's vision for self-reliance in healthcare innovation.

By emphasizing frugal innovation, patient safety, and contextual relevance, the AIIMS–IIT Jodhpur MedTech model serves as a replicable framework for other institutions nationwide. It underscores the role of academia-industry-government convergence in translating indigenous ideas into scalable healthcare solutions. Through such synergistic efforts, India can empower its young innovators to redefine the landscape of biomedical technology, enhancing accessibility and quality of care while strengthening the nation's global footprint in MedTech innovation.

Collaboration also encourages international exchanges to improvise the ideas. India-Sweden centre proves as one of those examples.

Boost is also being given to ignited minds in India and governmental agencies have also initiated and created modes to nurture young minds. BIG grants, MedTech Mitra, Biodesign fellowships are some of the avenues available in country to shape innovation arena.

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95th Annual Session and Symposium on

Healthy Brain, Mind and Cognition: From Computers to Clinics

Hosted by

Indian Institute of Technology Guwahati (IITG), Assam

https://event.iitg.ac.in/nasi95/

-- Programme --

Day 1: Monday, December 08th, 2025

- **Registration** (09:00– 10:00): *Venue- Conference Centre Foyer*
- **Coordinators:** *Dr. Shirisha Nagotu, Dr. Kusum K. Singh, Dr. Sweta Tiwari, IITG*

Children's Science Meet (10:00 – 11:30) *Venue - Auditorium*	
Chairpersons	Prof. S.R. Joshi, (NEHU, Shillong) Prof. Anupam Saikia, (IITG)
Speaker-1	Prof. Pannalal Goswami Science Communicator & Award-winning Chemistry Teacher- Assam
Speaker-2	Mr. Rahul S. Chatterjee Science Communicator & National Award-winning Physics Teacher-Shillong

Inaugural Session (11:30–12:30) **Venue – *Auditorium***

Lunch (12:30 -14:00) Venue- Lake View Lawn

Symposium Talks: *Healthy Brain, Mind and Cognition: From Computers to Clinics*

Session 01 (14:00–15:40): Symposium Talks Venue: Conference Hall 01	
Chairperson Co-Chair	Prof. Balram Bhargava, Former Secretary ICMR; Past President, NASI Prof. Sanjay Behari, Director, SCTIMST, Trivandrum
(Co-Conveners) 14:00 – 14:10 (05 min each)	Genesis of the Symposium Prof. Jayesh R. Bellare, General Secretary, NASI Prof. Venkatasubramanian G, NIMHANS, Bangalore
Speaker-1 14:10 – 14:40	Prof. Vatsala Thirumalai, NCBS, TIFR, Bangalore Title: Generating and Using Predictions of the World: A Role for the Cerebellum
Speaker-2 14:40 – 15:10	Prof. Arjun Ramakrishnan, BSBE Department, IIT Kanpur Title: Neuroengineering for Mental Health: Understanding the Mechanisms Underlying Suboptimal Decision Making in Anxious Individuals.
Speaker-3 15:10 – 15:40	Prof. Vibin Ramakrishnan, BSBE Department, IITG Title: Unconventional Therapeutic Strategies for Slowing Alzheimer's Progression

Tea Break (15:40 – 16:00): Venue- Foyer Conference Centre

Session 02 (16:00 – 17:00) Symposium Talks, Venue: Conference Hall 01	
Chairperson Co-Chair	Prof. Ashok Puranik, Director, AIIMS, Guwahati Dr. Pratima Murthy, Director, NIMHANS, Bangalore
Speaker-1 16:00 – 16:30	Prof. Neelam Sinha, Centre for Brain Research, IISc, Bangalore Title: Generative AI in Neurodegeneration Studies
Speaker-2 16:30 – 17:00	Dr. Shubhadeep Bhattacharjee, Electrical Eng. Dept., IIT Hyderabad Title: The Deep Trouble with Deep Neural Networks (DNNs): A Hardware Perspective

Session 03 (17:15-18:00) **Foundation Day Lecture** Venue: Auditorium	
Chair	Prof. Ashok Misra, Convener & Past President-NASI
Speaker	Mr. Kris Gopalakrishnan, Co-founder, Infosys Title: Role of Academia in Creating Viksit Bharat

Cultural Night (18:30 – 20:00) Venue- Auditorium

Coordinator: Dr. Meena Khwairakpam, IITG
Sattriya Dance (Performer: Dr. Anwesa Mahanta and Team)

Dinner (20:00 – 21:30) – Venue: Lake View Lawn

Day 02: Tuesday, December 09th, 2025

Session 04 (09:00 – 10:30) Symposium Talks Venue: Conference Hall 01	
Chairperson Co-Chair	Prof. Jayesh R. Bellare, General Secretary, NASI Prof. Ashis K Mukherjee, Director - IASST, Guwahati
Speaker -1 09:00 – 09:30	Dr. Sridharan Devarajan, Center for Neuroscience, IISc Bangalore Title: Computational Connectomics: Discovering Brain Network Bases of Health and Disease
Speaker-2 09:30 – 10:00	Prof. Venkatasubramanian G, NIMHANS, Bengaluru Title: Network Psychiatry: Translational Implications
Speaker-3 10:00 – 10:30	Dr. Nivethida T, BSBE Department, IIT Bombay Title: Redefining Targets in Neuromodulation: From Regions to Networks

Poster Session 01 (10:30 – 11:30): Venue-*Foyer, Conference Centre*

Chair/Coordinator (Sectional Presidents)

- Physical Sciences: Prof. Annapurni Subramaniam, Director, Indian Institute of Astrophysics, Bengaluru
- Biological Sciences: Prof. Sanjeev Misra, Vice-Chancellor, Atal Bihari Vajpayee Medical University, Lucknow

Tea Break (10:30 – 11:30) Venue -Foyer, Conference Centre

Session 05 (11:30 – 13:00) Symposium Talks	*Venue: Conference Hall 01*
Chairperson Co-Chair	Prof. Rama Shanker Verma, Director, MNNIT Allahabad Prof. Krishanu Ray, Director, NBRC, Manesar
Speaker -1 11:30 – 12:00	Prof. Arun S P, Centre for Neuroscience, IISc. Bangalore Title: Neural Basis of Real-world Vision
Speaker -2 12:00 – 12:30	Prof. Thomas Gregor Issac, Centre for Brain Research, IISc. Bangalore Title: Understanding Aging Brain and Predementia Syndromes
Speaker-3 12:30 – 13:00	Dr. Palash Ghosh, Mathematics, IIT Guwahati Title: Protecting Privacy in the Digital Journey: Differential Privacy Solutions for Sensitive Binary Data from Humans to Computers.

Lunch (13:00 – 14:00): Venue- Lake View Lawn

Session 06 (14:00 – 15:00) Symposium Talks	*Venue: Conference Hall 01*
Chairperson Co-Chair	Prof. Amit P Sharma, ICGEB, New Delhi Prof. Ishan Kumar Patro, Jiwaji University, Gwalior
Speaker-1 14:00 – 14:30	Dr. Nikunj Arunkumar Bhagat, Electrical Eng. Dept., IIT Kanpur Title: Advancing Neuro-rehabilitation: The Role of Brain-Computer Interfaces
Speaker -2 14:30 – 15:00	Prof. Arpan Banerjee, National Brain Research Centre, Manesar Title: Understanding the Neural Dynamics of Affective Flexibility from Naturalistic Stimuli: A Key to Quantitatively Evaluate Well-being

Poster Session 02 (15:00 – 16:00) Venue-*Foyer, Conference Centre*

Chair/Coordinator (Sectional Presidents)

Tea Break (15:00 – 16:00): Venue- Foyer, Conference Centre

Session 07 (16:00 – 17:00) Symposium Talks	*Venue: Conference Hall 01*
Chairperson Co-Chair	Prof. Smita Mahale, Emeritus Scientist, ICMR- NIRRCH, Mumbai, India Prof. K.S. Rangappa, Former Vice-Chancellor, University of Mysore
Speaker-1 16:00 – 16:30	Dr. Krishna Veer Singh, Co-Founder & CEO - LISSUN, Gurgaon Title: Healthy Minds, Smarter Clinics: Using AI to Empower Therapists and Scale Child & Adolescent Mental Health
Speaker-2 16:30 – 17:00	Dr. Rimjhim Agrawal, Co-Founder & CTO, Brain Sight AI Pvt Ltd Title: Advances in AI-powered Neurotechnology: Translation in Clinical Applications

Session 08 (*17:00 –17:30*) **Plenary Talk** *Venue- Conference Hall 01*	
Chair Co-Chair	Prof. Vinod K Singh, President, NASI Dr. Pratima Murthy, Director, NIMHANS, Bengaluru
Speaker	Dr. Swati Piramal, Vice Chairperson, Piramal Enterprises Limited Title: The Future of Health

Session 09 (*19:00 –20:00*) **Plenary Talk** *Venue- Conference Hall 01*	
Chair Co-Chair	Prof. Venkatasubramanian G, Co-convener, NIMHANS, Bengaluru Prof. Jayesh R Bellare, Co-convener & General Secretary, NASI
Speaker	Prof. Mriganka Sur, Newton Professor of Neuroscience and Director of the Simons Center for the Social Brain at MIT, Cambridge, Massachusetts US Title: Neuroscience and Next Generation AI

Dinner (*20:00 – 21:30*) *Venue- Lake View Lawn*

Day 03 Wednesday December 10th, 2025

Scientific Sessions (9:00 – 10:45) *Venue: Conference Hall 01 & 02* **Sectional President's Address**	
Chairpersons	Prof. Latha Rangan, Organizing Secretary, IIT Guwahati Prof. Daya Shankar Pandey, General Secretary, NASI
Sectional President (Physical Sciences)	Prof. Annapurni Subramaniam, Director, Indian Institute of Astrophysics, Bengaluru Title: Astronomy from Ground and Space
Sectional President (Biological Sciences)	Prof. Sanjeev Misra, Vice-Chancellor, Atal Bihari Vajpayee Medical University, Lucknow Title: Nurturing Innovations in Healthcare
Session 10-a Physical Sciences – Conference Hall 01	
Chairperson Co-Chair	Prof. Annapurni Subramaniam, Director, IIA, Bengaluru Prof. R K Vatsa, Homi Bhabha National Institute, Mumbai
Speaker-1	Prof. Tanusri Saha Dasgupta, Director, SNBNCBS Kolkata Title: Design and Understanding of Materials Physics: A Machine-learning Approach
Speaker-2	Prof. Dibyendu Nandi, CESSI, IISER Kolkata Title: Living with Stars: Understanding the Sun's Influence on Planet Earth
Session 10-b Biological Sciences – Conference Hall 02	
Chairperson Co-Chair	Prof. Sanjeev Misra, Vice-Chancellor, ABV Medical University, Lucknow Prof. Ashok Puranik, Director, AIIMS, Guwahati
Speaker-1	Prof. Praveen Sharma, AIIMS Jodhpur Title: Clinical and Molecular Insights into Lead Toxicity
Speaker-2	Dr. Shirisha Nagotu, BSBE Department, IIT Guwahati Title: Parkinson's Disease: Novel Insights into the Cellular Alterations using a Yeast Model

Tea Break (10:45 – 11:00) Venue- Foyer, Conference Centre

Session 11 & 12 11:00 – 12:30 – **Young Investigator Talks (Oral Presentations)** **Physical Sciences** *Venue:* Conference Hall 01 Chairpersons/Evaluator(s) – Prof. Annapurni Subramaniam, Director, IIA, Bengaluru Prof. R K Vatsa, Homi Bhabha National Institute, Mumbai	
Sessions 11-a	Talk 1: Ajit Kumar Maddheshiya, University of Allahabad, UP Talk 2: B.K. Tiwari, University of Amarkantak, MP Talk 3: Jyoti Prasad Deka, Assam Engineering College, Assam
Sessions 12-a	Talk 4: Manoj Kumar Gupta, CSIR-AMPRI, MP Talk 5: Ram Prakash Sharma, NIT Arunachal Pradesh
Biological Sciences *Venue:* Conference Hall 02 Chairpersons/Evaluator(s) – Prof. Sanjeev Misra, VC, ABV Medical University, Lucknow Prof. Ashok Puranik, Director, AIIMS, Guwahati	
Sessions 11-b	Talk 1: Debabrata Dash, Harisingh Gour Vishwavidyalaya, MP Talk 2: Lekhan Lodhi, Gyanveer University, MP Talk 3: Pankaj Srivastava, University of Allahabad, UP
Sessions 12-b	Talk 4: Tapan K. Chaudhuri, IIT Delhi Talk 5: Tapas C Nag, AIIMS, New Delhi Talk 6: Umesh Kumar, University of Allahabad, UP

Discussion, Recommendations and Valedictory Session (12:30 – 14:00)

Chairpersons: Prof. Vinod K. Singh and Prof. Ashok Misra

Venue- Conference Hall 01

- Group Photo
- Lunch and Departure

Lunch (*14:00 onwards*) *Venue- Lake View Lawn*

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Miscellaneous Calendar-Based Activities/Meetings

- **NASI Council Meeting** (Only for the Council Members of NASI)
  December 09th, 2025 at 15:00 – 16:00
  Venue- Board Room, Admin Building

- **Fellows Meeting** (Induction of Newly Elected Fellows)
  December 09th, 2025 at 17:30 – 18:30
  Venue: Conference Hall 01

- **Annual General Body Meeting (AGM)** Only Fellows and Members of NASI
  December 09th, 2025 at 18:30 – 19:00
  Venue- Conference Hall 01

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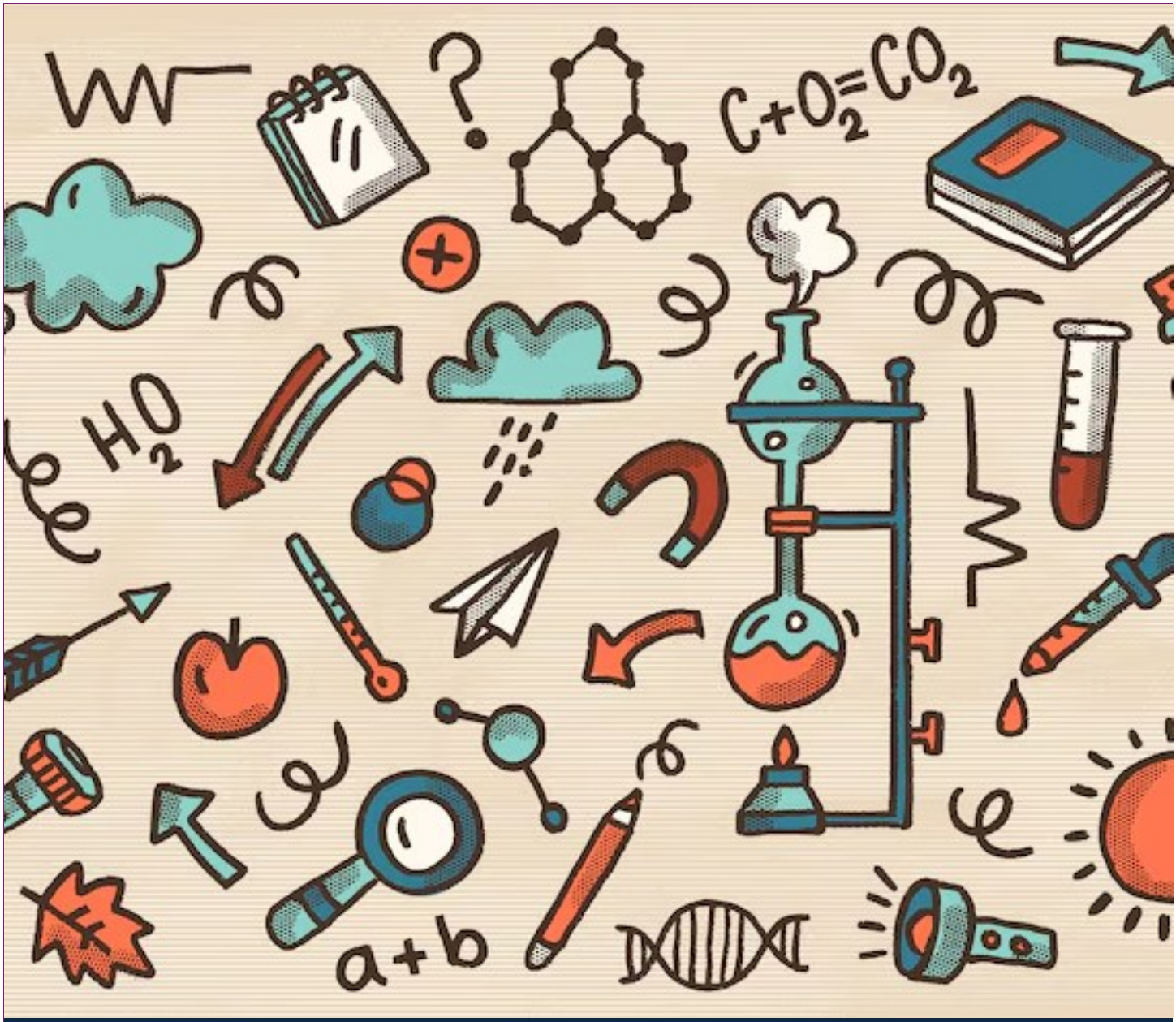

Abstracts

Physical Sciences

National Academy of Sciences, India

95th Annual Session

Indian Institute of Technology Guwahati

Invited Speakers

ILP1. Design and Understanding of Materials Physics: A Machine-learning Approach

Prof. Tanusri Saha-Dasgupta
Director | SNBNCBS
Department of Condensed Matter Physics & Materials Science, Thematic Unit of Computational Materials Science, S. N. Bose National Centre for Basic Sciences, Kolkata, India
Email: t.sahadasgupta@gmail.com

One of the strong pillars in advancement of designed materials and understanding of its physical properties is computation. The synthesis and optimization of properties of materials in experiment is both time-consuming and costly, being mostly based on trial and error. Computational approach in this connection is of natural interest to screen materials, before they can be suggested and tested in the laboratory. In the discussed approach new materials have been computationally predicted by combining electronic-structure methods with intelligent machine learning technique based on data mining and database construction. As will be discussed, this also helps in rendering microscopic understanding. Application will be discussed for prediction of new magnetic double perovskites [1], low-cost rare earth based permanent magnets [2], semiconductor heterostructures [3], binary nanoalloys [4], atomic wire formation [5] and understanding elastic properties of MAX compounds [6].

[1] Halder A, Ghosh A, and Saha Dasgupta T 2019 *Phys. Rev. Materials* 3, 084418.
[2] Halder A, Rom S, Ghosh A, and Saha-Dasgupta T 2020 *Phys. Rev. Applied* 14, 034024.
[3] Rom S, Ghosh A, Halder A and Saha-Dasgupta T 2021 *Phys. Rev. Materials 5*, 043801.
[4] Ghosh A, Dutta S, and Saha-Dasgupta T 2022 *J. Phys. Chem. C* 126, 15, 6847.
[5] Ghosh A, Pabi B, Pal A and Saha-Dasgupta T 2023, *Nanoscale,* 15, 17045.
[6] Ghosh A and Saha-Dasgupta, 2025 *J. Phys. Mater.* 8 025001

ILP2. Living with Stars: Understanding the Sun's Influence on Planet Earth

Prof. Dibyendu Nandi
Center of Excellence in Space Sciences India (CESSI) and Department of Physical Sciences, IISER Kolkata
President, Commission E4, International Astronomical Union (IAU)
Coordinator, International Space Weather Action Team Education Cluster, Committee on Space Research (COSPAR)
Email: dnandi@iiserkol.ac.in

The Sun is a variable star whose activity originates in its magnetism. Solar like stars not only provide life sustaining radiation, they also govern the electromagnetic and particle environment around them in which planets and exoplanets reside. Using the Sun-Earth system as a window to this intimate relationship that planets share with their host stars, I shall describe our research to understand the genesis of solar activity, our efforts to develop pioneering models for space weather forecasting, and their applications to assessing the impact of solar activity on space-reliant technologies we critically depend on.

Accepted Abstracts

P-1. Microwave Assisted Green Synthesis, Characterization and Antibacterial Activity of Silver Nanoparticles

Abhay Yadav and Akanksha Tiwari

Department of Chemistry, Institute of Basic sciences, Dr. Bhimrao Ambedkar University, Khandari Campus, Agra

E.mail: abhayy128125@gmail.com

Microwave assisted green synthesis was used to synthesized silver nanoparticles (AgNPs) by using silver nitrate and trisodium citrate. The formation of nanoparticles was confirmed by UV-visible spectral studies. Particle size and morphology was determined by P-XRD and HR-TEM studies which revealed the average particle size of synthesized nanoparticles respectively 21.49 and 20.08 nm respectively with spherical shape. The synthesized nanoparticles were screened for antibacterial activity in vitro against gram +ve bacteria (Staphylococcus aureus and Bacillus subtilis) and gram – ve bacteria (Escherichia coli and Klebsiella pneumoniae) by adopting disk diffusion method. The results of antibacterial studies exhibited that AgNPs were potential antibacterial agent.

P-2. Detection of the Spectroscopic Biomarkers of the Copperoxide nanoparticles treated Allium satium plant by confocal Raman microspectroscopic technique

Abhi Sarika Bharti and K. N. Uttam

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Nanoparticles are widely used in commercial applications due to their unique physic chemical properties. Their extensive use leads to the accumulation of engineered nanoparticles in plants growing in nearby areas. Copper oxide nanoparticles (CuO NPs), commonly used in industries, including agriculture as fungicides, can contaminate soil and influence nutrient bioavailability in plants. With increasing CuO NP usage, their environmental impact poses a potential threat to ecosystems, making it essential to study their interaction with plant tissues. The study explores the use of confocal Raman spectroscopy as a non-invasive, rapid and label free technique to analyse copperoxide nanoparticle interaction with Allium sativum (garlic). Garlic plants were treated with CuO NPs at concentrations of 0.5, 1 and 2 mM. Raman Spectra were required to assess biochemical changes, revealing that lower concentrations (0.5 mM) prompted growth and enhance the biochemical composition, while higher concentrations (1 mM) inhibited it. The study highlights Raman spectroscopy as a valuable tool for biomonitoring and food quality assurance.

P-3. A Review of Biomedical Antennas: Current Role in Healthcare Industry and Research Area

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The development of radio-frequency (RF) antennas for biomedical applications has emerged as a critical interdisciplinary field, merging antenna theory, materials science, and human physiology to enable wireless communication, sensing, imaging, and therapy inside or on the surface of the human body. These abstract surveys key developments, design challenges, and recent innovations in the area of RF antennas for biomedical uses, especially implantable and wearable systems. Biomedical RF antennas must satisfy several stringent requirements: miniaturization to fit into limited space; biocompatibility of materials and coatings; predictable performance in lossy and heterogeneous tissue environments; acceptable levels of electromagnetic energy absorption (often quantified via Specific Absorption Rate, or SAR); stable frequency response despite detuning by biological media; sufficient bandwidth (or multiband capability) to support data transmission, power transfer, or imaging; and in some cases flexibility or conformability. Supporting applications range from biotelemetry (transmission of vital signs - heart rate, intra- ocular pressure etc) to imaging (MRI, radio-thermometry), and therapeutic uses (hyperthermia, RF ablation). Recent progress includes development of dual-band and multiband implantable antennas operating in the Industrial, Scientific and Medical (ISM) and Medical Implant Communication Service (MICS) bands, with designs that preserve circular polarization or linear polarization depending on link requirements and operate well in realistic tissue phantoms as well as ex vivo/ in vivo testing. For instance, a recent work explores dual-band implantable/transmitter and on-body/receiver antennas for biotelemetry in 2.4-2.4835 GHz and 5.725-5.875 GHz ISM bands, demonstrating bandwidth preservation in lossy media and measurable transmission coefficients between implanted and on-body antennas. Wearable and imaging antennas have also advanced: ultra-wideband (UWB) antennas are being surveyed for biomedical imaging applications, enabling high resolution and penetration, while patch or leaky-wave designs are being explored for MRI transmit arrays with improved transmit efficiency and reduced SAR. Thermal safety remains a central challenge. The invasive or semi-invasive placement of RF antennas leads to heat generation in nearby tissues. Studies of thermal effects examine how antenna geometry, operating frequency, input power, and duration of exposure contribute to temperature rise and SAR distribution. Design strategies include non-resonant structures (e.g., leaky- wave surface coils) or conformal arrays to distribute power, mitigations of near-field intensities, and modelling in realistic anatomical phantoms. Despite advances, challenges remain: achieving high radiation efficiency in lossy media, minimizing size without greatly sacrificing bandwidth or gain, material stability and biocompatibility over long periods in vivo, integrating power transfer and data communication safely, and regulatory and standardization aspects. In conclusion, RF antenna development for biomedical applications stands at a promising juncture: combining innovative design (multiband, conformal, non-resonant), materials (flexible, biocompatible, biodegradable), and system-level considerations (safety, power, performance). Future directions point toward fully implantable wireless systems that are minimally invasive, long-lived, safe, and capable of high-fidelity biomedical monitoring, imaging, or therapy.

P-4. Enhancing Thermal Efficiency in Solar Collectors Using Second-Grade Nanofluid Flow with Ai-Based Neural Networks.

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The current research focuses on enhancing the thermal performance of convective flow of second grade fluid across a Riga plate considering the impact of heat source and thermal jump mechanism. The mathematical framework for analyzing this flow is constructed using Buongiorno's model, describing the effects of thermophoresis and Brownian motion. Further, the mathematical model is transformed into non-linear differential equations, which are then solved using the Runge Kutta method combined with Newton's iteration and the stimulus of pertinent parameters on velocity profile, temperature profile and solutal profile shown by graphs. Moreover, artificial neural networks using the Levenberg–Marquardt technique are used to quantitatively evaluate heat and mass transmission on Riga plate surface. The proposed algorithms' prediction performance is scrutinized by employing correlation, fitting analysis, regression, mean squared error, absolute error, and error histograms. This investigation underscores the usefulness of soft computing methods in accurately examining the behavior of flow models.

P-5. Machine Learning and Deep Learning Assisted Confocal Micro Raman Spectroscopy for Monitoring Mung Plant Responses to Silicon Dioxide Nanoparticles.

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This study investigates the potential of integration of confocal micro-Raman spectroscopy with machine learning and deep learning algorithms to assess biochemical responses of mung bean plants exposed to silicon dioxide nanoparticles (SiO 2 NPs) at varying concentrations. The analysis of acquired Raman spectral data reveals a concentration dependent pattern where low concentrations (0.2-0.6 mM) reduce the intensities of key biomolecules such as carotenoids, lignin, pectin, protein, carbohydrate, and cellulose, while higher concentrations (1.2-1.4 mM) trigger enhancement in intensities. Among computational approaches, the application of dimensionality reduction techniques such as linear discriminant analysis (LDA) significantly improve the performance of clustering algorithms learnings like AGNES (RI=1.00), DBSCAN (RI=0.99), and k-means (RI=1.00) and deep learning models, achieving high classification accuracy. Supervised algorithms like random forest and support vector machine perform optimally without dimensionality reduction, showing accuracies of 78% and 79% respectively. This integrated spectroscopy-computational approach offers a non-invasive, label-free, and robust framework for monitoring plant-nanomaterial interactions.

P-6. Scanning Acoustic Microscopy: Visualizing the Internal Structure of Materials.

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Scanning acoustic microscopy (SAM) was used to characterise the acoustic properties of various materials without causing any damage. With submicron resolution, the SAM can observe not only the surface but also the inside structure of a biological specimen without causing damage. This technology has been used to visualise the internal structure of materials, also known as bulk imaging of composites. Using SAM, acoustic microscopy up to 1 GHz was used to characterise a variety of materials, including biomaterials and 2D system-based micro-LEDs. In the future, we plan to combine acoustics with X-ray synchrotron radiation. This integration could be used in biomedical applications to create 3D imaging with less ionising radiation exposure.

P-7. Thermodynamic Behavior of Al Nanoparticles via Machine Learning

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Machine learning interatomic potentials (MLIPs) have emerged as powerful tools to study thermodynamic properties of nanoscale systems with near first-principles accuracy. In this work, we develop a MACE model, based on equivariant message-passing neural networks, to investigate the thermodynamic behavior of the aluminum nanoparticle Al53. The model was trained on density functional theory (DFT) data and validated against reference energies and forces, yielding root mean square er-rors of 0.477 meV/atom and 18.291 meV/ ˚A , respectively. Using molecular dynamics simulations combined with the multiple histogram technique, we computed the heat capacity and extracted the melting temperature. The predicted melting point of 628 K shows excellent agreement with the experimental value of 623 K. Root mean square fluctuation (RMSF) analysis further reveals the atomic-level dynamics across the solid–liquid transition. Additionally, we compare the performance of the present MACE model with previously reported GAP, DP, and universal MACE models, high- lighting its reliability for cluster-scale thermodynamics. Present study demonstrate the capability of MACE to bridge the accuracy of DFT with the efficiency of molecular dynamics for free nanoparticles, opening the way for predictive studies of finite-size effects in nanomaterials.

P-8. Multicomponent Ecofriendly Synthesis and Biological Applications of 4-arylidine isoxazolidinones

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A novel group of 4-arylidine isoxazolidinones have been synthesized via a multicomponent reaction in a one-pot process. The desired compounds were generated using numerous aromatic aldehydes , hydroxylamine hydrochloride and ethyl acetoacetate in aqueous medium in the presence of Vitamin B_1 as an organocatalyst. Fourier Transform Infrared Spectroscopy and Nuclear Magnetic Resonance Spectroscopy characterization was performed to confirm the structural framework. The proposed protocol has several merits like broad substrate scope , no need for chromatographic sepearation , affordable and so on. The antibacterial activity of the target moiety was analyzed with two bacterial strains , Gram positive *Staphylococcus aureus* and Gram negative *Eschericia coli* . Rifampicin was selected as the reference antibiotic. The molecular docking evaluation ascertains the fact that the synthesized molecule and the target receptor protein possess a strong binding affinity and a negative docking score thus can become suitable candidates for discovering novel drugs.

P-9. pH-Responsive Amphiphilic Hydrogels: Drug Delivery Systems

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pH-responsive amphiphilic hydrogels have emerged as a versatile class of smart biomaterials due to their unique ability to undergo structural and functional changes in response to environmental pH variations. Their amphiphilic nature enables the simultaneous incorporation of hydrophilic and hydrophobic domains, allowing precise modulation of swelling, degradation, and molecular interactions. A hydrophilic group of a monomer is cross-linked with chemically and physically to form a three-dimensional (3-D) network structure in polymers known as hydrogels. The properties of absorbed high water content, porosity, consistency, great flexibility, and biocompatibility in the advancement of biomedical fields. However, the key of feature of pH-responsive hydrogels is their exceptional ability to release or receive protons in response to changes pH in the medium's ionic strength. pH responsiveness in amphiphilic hydrogels, their design strategies, and current applications, with particular emphasis on their role as advanced drug delivery systems.

P-10. Rapid chemo-specific sensing of Manganese ion via Ninhydrin functionalized silver nanoparticles with surface enhanced Raman spectroscopy.

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A highly sensitive surface-enhanced Raman spectroscopy (SERS) platform has been developed for the selective detection of divalent manganese (Mn(II) ions using Ninhydrin-functionalized silver nanoparticles (N-AgNPs) synthesized via a chemical reduction method under ice-bath conditions. The synthesis protocol and corresponding spectral characteristics establish a foundation for portable and miniaturized SERS-based sensors for rapid, on-site Mn(II) detection in aqueous solutions. Ninhydrin molecules anchored on the AgNP surface exhibit strong affinity toward Mn(II) ions through Mn–O coordination, acting as efficient Raman reporters. The introduction of Mn(II) ions induces controlled aggregation of the N-AgNPs, generating intense SERS signals proportional to the metal ion concentration. Under optimized conditions, the detection limit (LOD) was achieved at 6 µM with a linear response range of 50–350 µM. The practical applicability of the proposed SERS platform was validated by analyzing Mn(II) ions in real water samples. Tap water samples spiked with 50 µM Mn(II) ions were tested, where the observed Raman intensities varied with sample composition. Quantification based on the calibration curve provided recovery values between 92% and 105%, confirming the reliability and reproducibility of the method. The study demonstrates that N-AgNPs can serve as an efficient SERS substrate for trace-level Mn(II) detection, offering a promising analytical approach for environmental monitoring and water quality assessment.

P-11. Spectroscopic Evaluation of Alteration in Biochemical Profile of the Leaves of Maize Seedlings Due to the Impact of Iron Oxide Nanoparticles.

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This study aims to explore the potential of non-destructive, sensitive and advance confocal micro-Raman spectroscopy to analyze the effect of iron oxide nanoparticles on physiological and biochemical response of maize seedlings. The analysis of the acquired Raman spectra of the adaxial surface of the leaf of the control and iron oxide treated maize seedlings shows that iron oxide nanoparticles affect the biochemical profile, growth and development of maize seedlings. Due to the treatment of iron oxide nanoparticles, the level of biochemicals like carotenoid, cellulose, carbohydrates, lignin, protein, pectin and aliphatic increases in the leaves of maize seedlings as compared to control in a dose-dependent manner, indicating that iron oxide is favorable for the cell wall component, carotenoid and other biochemicals present. In addition, the analysis of Principal component analysis (PCA) reveal that first three PC's are able to shows 93 % of total variation in data sets, showing that PCA is able to capture the variations in Raman data induced due to nanoparticle exposure. The results show that using confocal micro-Raman spectroscopy along with data mining approaches like PCA, enables to detect subtle molecular changes in plant species, offering an understanding of how nanoparticles influence plant physiology and biochemistry in a rapid, non- destructive and early manner.

P-12. A Comparative Behavioural Study of the Impact of Sustained Classical Music Exposure on Affective Control

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This study aims to investigate whether long-term exposure to Indian classical music in listeners demonstrates superior affective control compared to those with minimal exposure. A between-subjects design was employed with 20 adults divided into two groups: a High-Exposure group (n=10) with over five years of active engagement (listening or performance) with Classical music, and a No-Exposure group (n=10) with less than one year of exposure or no exposure. Affective control was measured using the Affective Stroop Task, which requires participants to inhibit emotional distractors in order to identify the colour of negative, positive, and neutral words. Data will be presented to show that sustained exposure to classical music is associated with significantly enhanced behavioural and physiological indices of affective executive control. It suggests that engagement with complex musical structures in Indian classical music trains the neural circuits in the limbic system of the brain to regulate cognitive-emotional responses. The study suggests that Indian classical music has the potential to serve as a non-pharmacological intervention for enhancing emotional resilience.

P-13 Valorization of Sugarcane Bagasse through an Integrated Biorefinery Approach for Sustainable Vanillin Production

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Sugarcane bagasse, an abundant lignocellulosic by-product of the sugar industry, holds immense potential for conversion into high-value chemicals through green biorefinery routes. The present study explores an integrated approach for the sustainable production of vanillin from sugarcane bagasse- derived lignin. The process involves sequential fractionation of biomass followed by catalytic oxidative depolymerization of lignin under mild conditions to yield vanillin with improved selectivity and yield. The co-production of fermentable sugars and lignin-derived intermediates enhances process efficiency and economic viability. This integrated biorefinery model exemplifies the waste-to-wealth concept and supports national priorities in renewable resource utilization, aligning with the United Nations Sustainable Development Goals.

P-14. Green Synthesis of 2-Amino 3-Cyano Pyridine Derivatives and Their Biological Applications

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The one-pot multi-component reaction (MCR) of aniline, benzaldehyde, acetophenone, and malononitrile in the presence of visible light is used in this environmentally friendly, efficient method of synthesizing 2-amino-3-cyanopyridine derivatives in a green aqueous medium. The present procedure is the first 2-amino-3-cyanopyridine derivative synthesis reported to be mediated by visible light. The utilization of water as the reaction medium and visible light as an energy source and promoter are the main characteristics of the technologies that have been revealed. The use of easily accessible reactant moieties, appropriate reaction conditions, functional simplicity, wide substrate availability, quick reaction times, and high yields are additional significant characteristics of the aforementioned method. These factors make the current reaction procedure a true green protocol, outperforming the previously documented methods. The antibacterial activity of synthesized target molecule has been carried out with gram positive and gram negative bacteria *viz. Staphylococcus aureus* and *Eschericia coli.*

P-15. Assessment of groundwater Quality for DRINKING purpose IN AGRA INDIA

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This paper presents an analytical evaluation of the various parameters of groundwater sources of Agra city. Depending upon depth, hydrogeological conditions and human activities groundwater quality shows wide variations. Agra is situated on the banks of Yamuna River known for its brackish water, also the south-west side of city lies near fluoride rich area of Rajasthan. Therefore, the use of bottled water as source of drinking water is gaining momentum day by day. These facts make this study even more relevant. Ten samples of bottled water were purchased from local markets. Two samples of municipal tap water from different locations were collected in clean sterile bottles while ground water samples were taken from bore wells from various locations in different parts of city. It is observed that the fluoride levels in bottled water are below recommended limits (0.07-0.35 mg/l) whereas in ground water fluoride levels are much higher. The groundwater samples also show higher values of hardness, TDS. The spatial distribution of fluoride, as estimated by geochemical assessment, agrees well with the incidence of dental and skeletal fluorisis. Apart from already affected people, a larger part of population is at risk. Similarly estimation of other parameters like hardness etc. agrees well with observed ill effects.

P-16. Long –Term Influence of Sporadic Solar Activity on Cosmic Ray Modulation

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Coronal mass ejections (CMEs) produce Forbush effects as well as long-term modulations in cosmic rays. This makes coronal ejections is the main sporadic manifestations of the solar activity, which should be considered in modulation on galatic cosmic rays . In this observation, a new version of the CME-index is proposed based on a comparison of the data from satellite coronographs with long-term variations of cosmic rays and Forbush effects. It is observed that the during minimum phase of Solar activity , the strength of the interplanetary magnetic field has been minimum, reduces the GCR entering inner- heliosphere and high anti-correlation with solar activity indices. It is also found that velocity of solar wind (Vsw) and turbulence and strength of the interplanetary magnetic field were positive correlated and inverse correlated with count rate of cosmic ray intensity.

P-17. Influence of Sporadic Solar Activity on Cosmic Ray Modulation

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P-18. Study of Long-Term Modulation of Cosmic Rays due to Solar activity

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The solar magnetic field that began a major trend at the end of solar cycle 22 continues to be observed. The main characteristics of the solar magnetic field and the associated heliospheric field are crucial to the modulation of cosmic rays. Long-period variations of cosmic rays in cycles 23–24 show a weakening of the solar magnetic field. A comparison of these variations and those of the previous cycles (21–22) reveals features of the modulation in the last two cycles. It is observed the weakest ever in the period of neutron monitor operation.

P-19. Sustainable Heat Transfer Enhancement in Magneto-Hydrodynamic Squeezing Eco- Friendly Nanofluids Using Physics Informed Neural Networks.

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Energy storage, heat transfer, and machinery cooling systems are vital for achieving sustainability in industrial operations. In this regard, it is crucial to solve industrial issues more precisely parameterized governing equations in order to quickly find solutions for a number of design parameter and its combinations. In order to solve parameterized convective heat transport equations, this work presents Scientific machine learning - driven Automatic hyperparameter tuning Physics-Informed Neural Networks (Auto-PINNs). Unlike classical computational fluid dynamics (CFD), Auto-PINNs do not need solving individual instances by integrating design factors into the network inputs with hyperparameters tuning. In this research the nanofluid flow and heat transfer of magneto-hydrodynamic squeezing nanofluid through parallel plates has been studies by this unique scientific machine learning techniques. The fluid employed in this research is a combination of ecofriendly deep eutectic solvent (DES) and Fe_3O_4 for the sustainable heat transfer. To show the efficacy of the unsupervised Artificial Neural networks (ANN) approach, the best outcomes were then contrasted with numerical solutions produced using the Runge-Kutta technique utilizing the BVP4c tool as a reference solution. Our results show the greatest difference in the flow speed and energy profiles, indicating a high agreement with the numerical technique.

P-20. Analysis of Optimization of Nanofluid Flow over a Rotating Cone–Disk System with Artificial Neural Network Prediction

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The present work focuses on the numerical investigation of entropy optimization in a nanofluid mixture confined within a cone–disk arrangement embedded in a porous medium. The rotating cone drives the fluid motion in the interstitial region, and the flow dynamics are modeled through the Darcy– Brinkmann formulation. The analysis is carried out under steady-state assumptions while accounting for a transverse magnetic field and three distinct dissipation mechanisms, such as Darcy resistance, viscous friction, and Joule heating. Numerical outcomes are obtained using the MATLAB-based BVP4C solver, supported by Runge–Kutta 4th-order schemes for solution stability. To further accelerate predictions of the heat transfer coefficient, a supervised artificial neural network (ANN) framework is developed and validated. The present investigation explores entropy minimization as a pathway to enhance thermal performance in a rotating cone–disk configuration. The outcomes indicate strong potential for applications across diverse sectors, including energy conversion, electronic device cooling, thermal regulation systems, nuclear engineering, ceramic processing, and radioactive material handling.

P-21. Greener and expeditious microwave assisted synthesis, spectral and antimicrobial evaluation of hydrazones and their transition metal complexes.

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Two new series of Co (II) Ni (II) and Cu (II) metal complexes of the type [M (C17H16N4O2).2H2O] Ac2 and [M (C17H14N4O4).2H2O], where M= Co (II)/ Ni (II)/ Cu (II) and Ac=CH3COO-, have been synthesized in a microwave synthesizer. All the synthesized compounds were characterized by running their TLC for single spot, elemental analysis, IR, 1H-NMR, 13C-NMR, magnetic susceptibility measurements and electronic spectral studies. Representative compounds have been screened for their antimicrobial activity. The zone of inhibition values of the compounds were determined by disc diffusion method against two bacteria Staphylococcus aureus and Escherichia coli and two fungi Aspergillus niger and Aspergillus flavus. The antimicrobial activity results indicated that metal complexes show increased activity in comparison of corresponding ligands.

P-22. Green Chemistry Approach: Synthesis, morphological and thermal studies of nanocomposites of barium carbonate nanoparticles.

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In the present study barium carbonate (BaCO3) nanoparticles were synthesized by using barium chloride dihydrate, sodium hydroxide, urea and lemon juice as reducing agent. Thereafter, one polymer polymethyl methacrylate and three nanocomposites have been synthesized by using different concentrations (0.025, 0.050, 0.075 mg) of nanoparticles by adopting microwave assisted method. Nanoparticles were characterized by FT-IR, UV-Visible, X-Ray Diffraction, Transmission Electron Microscopic (TEM) and Scanning Electron Microscopic (SEM) studies. Xray diffraction peak broadening was used to evaluate the sizes of nanoparticles by using Debye Scherrer equation. Nanocomposites were characterized by FT-IR, Scanning Electron Microscopic (SEM) studies. The thermal stability of polymer and nanocomposites was determined by TG/DTA. XRD studies and TEM images revealed average particle size of nanoparticles 17.09 nm. Thermal studies revealed that thermal stability of all nanocomposites has increased as compared to polymer.

P-23. Synthesis and Spectral Identification of Functionalized Nanocomposites and Its Applications

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Functional polymers have a wide range of applications *i.e.* biomedical applications, self-healing polymers, OLED devices, optical applications, etc. due to improved plasticity, ductility, heat resistance, etc. The present study contributed to reinforcing the concept of functionalization to design facile and cost-effective material with desired properties or tweak the existing properties of polymers. The advancement of this research work provided insight into the effect of different amino functional groups on the optical properties such as UV shielding, morphology, fluorescence, and crystallinity of PMMA. Results indicated that PHNG3 exhibited very strong UV absorption in comparison with other fun- PMMAs. The chemical shift (δ) at ~3.5 ppm for β-NH/NH_2 and the existence of aromatic protons at ~7.138 to 9.134 ppm confirmed the functionalization of PMMA.

P-24. Synthesis, characterization, density functional theory calculations and in-vitro antidiabetic activities of vanadium complexes

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Vanadium-based compounds have gained considerable attention due to their potential as insulin-mimetic agents and therapeutic candidates for diabetes management. In this study, a series of vanadium complexes were synthesized and structurally characterized using spectroscopic and analytical techniques, including UV–Vis, FT-IR, NMR, mass spectrometry, and elemental analysis. The molecular geometry and electronic properties of the synthesized complexes were further investigated through density functional theory (DFT) calculations to gain insights into their stability, frontier molecular orbitals, and reactivity descriptors. In-vitro antidiabetic assays, such as α-amylase and α- glucosidase inhibition, were performed to evaluate their biological potential. The results demonstrated that the vanadium complexes exhibited significant inhibitory activity, suggesting their ability to regulate postprandial hyperglycemia. Correlation between experimental findings and theoretical calculations provided a deeper understanding of structure–activity relationships. Overall, this work highlights the potential of vanadium complexes as promising antidiabetic agents and underscores the relevance of integrating experimental and computational approaches in drug design.

P-25. Reliability Challenges and Degradation Pathways in Photovoltaic Modules

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The reliability and degradation analysis of photovoltaic (PV) modules is essential for accurately predicting their service lifetime under outdoor conditions. This requires a systematic evaluation of failure modes and degradation mechanisms, as both directly influence module performance over time. To address this, the Risk Priority Number (RPN) method is applied to identify and rank the critical factors affecting system reliability across different technologies and locations. The analysis incorporates three key parameters: severity, occurrence, and detection. In addition, the Arrhenius equation is employed to estimate module lifetime for various activation energy values. The overall aim of this study is to assess the performance and degradation behavior of PV modules, while identifying the dominant failure mechanisms and failure modes responsible for long-term performance loss.

P-26. DBU catalysis in micellar medium: An atom economic, efficient and environmentally benign synthesis of 1-amidoalkyl-2-naphthol derivatives.

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An efficient, atom economic, simple, practical and scalable approach for the preparation of pharmaceutically important scaffold 1-amidoalkyl-2-naphthol derivatives using one-pot three-component condensation of substituted aromatic aldehydes, 2-naphthol and substituted amides under micellar medium as an environmentally benign protocol is reported. The reaction is catalyzed by DBU and CPB as a cheap, green and easily available sustainable catalyst. The product formation takes shorter duration with good to excellent yield of the products. The method is also demonstrated on multi-gram level. The Atom economy, environmentally benign, easy to work-up, no use of hazardous solvents, short reaction time are the most outstanding advantages of the developed methodology.

P-27. Predictability of Epileptic Seizure using Dendritic Learning

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In this work, we report on the predictability of Epileptic Seizure using the differential Hebbian learning rule known as Input-Correlation (ICO) learning. The analysis is done using the EEG signals generated in the Right Medial Entorhinal Cortex (EC) as the stimulus and the Dentate Gyrus of the Right Dorsal Hippocampus (DG) as the reference since the EC communicates with the DG through the perforant pathway. The EEG signals are smoothened using the Savitzky-Golay filter. For the EC (which is the stimulus signal), we used a 9th order polynomial with a time-frame of 131 time-steps and for the DG (which is the reference signal), we used a 7th order polynomial with a time-frame of 51 time-steps. On the analysis of the brainwaves in these two regions it is observed that the amplitude of oscillations increases rapidly to high values with the onset of seizure attack. But the application of the ICO learning rule in the pre-seizure stage depicts the output to be increasing rapidly and erratically and in the post-seizure stage, it monotonically decreases signifying the end of the seizure attack. From this, it could be ascertained that the EC stimulating the DG via the perforant pathway is what leads to a seizure attack. Furthermore, there is evidence of long-term potentiation (LTP) and long-term depression (LTD) in the evolution of the weight of the stimulus signal and uncontrolled LTP is what causes the seizure attack. In addition, the monotonic increase in the output of the ICO learning could be utilized as a measure of intervention in individuals already diagnosed with epileptic seizure.

P-28. Generation of Sub-Diffraction Light Sources via Photonic Nanojets

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Photonic nanojets (PNJs) are highly localized light beams generated by dielectric micro-particles such as microspheres or microcylinders. When these particles are illuminated, they confine and focus the incident light to produce a narrow, jet-like beam in the forward direction. The PNJ is defined by two key parameters: its length and its beam waist. Importantly, the full width at half maximum (FWHM) of the beam waist is smaller than the incident wavelength, making it a sub-diffraction-limited spot. This unique property has enabled numerous applications. In this work, we present theoretical investigations on the generation of sub-diffraction limited light source generated by PNJs. We further investigate on the effect of size, refractive index of microsphere on FWHM and length of the PNJs.

P-29. Surface plasma wave Assisted SHG in Metallic Nanotube embedded over Metal surface in presence of Magnetic Field

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We theoretically investigate the generation of second harmonics at metal-air surface by cosh-Gaussian laser in presence of an external static magnetic field. The laser interact with the electrons of carbon nanotube (CNT's) and excites them. The excited surface plasma wave exerts ponderomotive force on the electrons of cylindrical structured CNT's over the metal surface provides nonlinear surface current density and produces resonant second harmonic. The external transverse magnetic field enhance the second harmonic. We observe a resonant frequency at $\omega/\omega_p = 0.707$ for cylindrical structured nanoparticle. We explore the effect of various parameters on second harmonic as length and radius of nanotube, laser intensity, decentered parameter associated with hyperbolic cosine function.

P-30. Shape-Dependent Electromagnetic Field Enhancement in Gold Nanoparticles

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Gold nanoparticles have long attracted the attention of researchers and scientists due to their unique optical properties. The collective oscillation of conduction electrons in gold, known as Surface Plasmon Resonance (SPR), becomes strongly confined when particle dimensions are reduced to the nanometer scale. In such cases, this phenomenon is referred to as Localized Surface Plasmon Resonance (LSPR) or, in some contexts, Particle Plasmon Resonance (PPR). The localization of these oscillations leads to the formation of intense electromagnetic fields around the nanoparticles, resulting in a significant enhancement of the incident light intensity. Importantly, the characteristics of LSPR are not solely determined by the excitation wavelength of the incident electromagnetic wave but are also strongly influenced by the shape and size of the nanoparticles. In this work, we present a comparative study of electromagnetic field enhancement in gold nanospheres, nanorods, and nanotriangles.

P-31. Isolation, Characterization and Cytoprotecting Study of Curcumin on Hela Cells Against Aflatoxin Induced Toxicity

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Curcumin was isolated from turmeric, it is also known as diferuloylmethane or 1,7-bi(4-hydroxy-3-methoxyphenol)-1,6-heptadiene-3,5-dione, a natural yellow color compound present in rhizome of the plant Curcuma longa Linn. Curcumin also has been shown to possess various biological activities, such antioxidant, antimutagenic and anti-carcinogenic activities. The purpose of this study was to evaluate the concentration of curcumin for cytoprotecting study on HeLa cells. Aflatoxin was taken as a model-toxin and is isolated from a strain of *Aspergillus flavus*. Cytoprotective activities of curcumin was conducted on aflatoxin toxicity. They have been reported to be extremely carcinogenic, teratogenic, and hepatotoxic to both humans and animals.

P-32. Quantum Chemical and Molecular Dynamic Studies On 5-Hydroxy Methyl Uracil

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The computational calculation of 5-hydroxymethyl uracil (5HMU), was performed using the density functional theory (DFT) with B3LYP technique and 6–311 ++ G (d,p) as the basis set. The FT-IR, Raman, NMR (1H-NMR and 13C-NMR), and UV-Visible spectrochemical analyses were investigated computationally and experimentally. The optimized geometrical parameters were used to investigate and compute further calculations for NLO, NBO, NHO analysis, and FMO. Hirshfeld surface analysis was employed to investigate the intermolecular interactions in 5HMU and fingerprint plots were also generated." The interaction between donor and acceptor was determined by the NBO analysis. The MEP and Fukui functions highlighted the charge distribution and reactive areas of the molecule.

P-33. Atmospheric Ions and Their Role in Cloud Formation, Precipitation Development and Electrification Processes

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The multifaceted field of study of electrified clouds requires a thorough understanding of the many factors that influence their electrical conductivity. Researchers hypothesize that these clouds have a dominant positive dipole charge distribution, which plays a key role in determining their electrical properties. However, the concentration of small ions within the cloud is also affected by cosmic ray ionization, causing ion loss through various processes. One of the main challenges in studying electrified clouds is the presence of electric fields within the cloud, which can disrupt ion conduction. As a result, accurately measuring the electrical conductivity of clouds, especially in small-scale space charge fields and individual charged particles, can be difficult. To address these challenges, researchers focus on investigating charge transfer mechanisms in boundary regions and cloud updrafts, while also assessin the thickness of the charge distribution in the sheathing layer. This approach allows for a better understanding of the behavior of electrified clouds and the factors affecting their electrical conductivity. Thunderstorms with charged clouds and precipitation particles exhibit high electrical conductivity, which can vary due to several factors. However, the relaxation time may not always be short, especially in small-scale space charged fields and individual charged particles. This highlights the need for further research to increase our understanding of the complex behavior of electrified clouds and their impact on the environment.

P-34. Hydrophobic Piezoelectric Wearable Nanostructures for Harvesting Mechanical Energy

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Flexible 2D piezoelectric nanogenerators are attractive energy harvesting devices for powering small scale nanosystems and portable electronic devices. Recently, various type of piezoelectric nanostructures including zinc oxide (ZnO), gallium nitride (GaN), lead zirconium titanate (PZT) and barium titanate (BaTiO3) have been reported to convert mechanical energy into electrical energy. However, high output voltage along with flexibility and their integration with polymeric system remain challenging task. In this talk, we will discuss the fabrication of wearable piezoelectric nanogenerator based on tungsten disulfide (WS2) quantum dots and dip-coated conductive polyaniline (PANI) on cotton fabrics. Fully wearable nanogenerator showed high output voltage of 60 V and a current density of 302 nA/cm² under vertical mechanical strain and also exhibited high dielectric constant (ε′) of 799. Notably, the device maintained stable output performance under varying humidity conditions, remaining effective up to 60% relative humidity. The device Piezoelectric nanogenerators holds significant potential for future application such as to power personal electronics, and for self-powered nanosensor/piezophotonics applications.

P-35. Sustainable Dye Removal from Wastewater Using Biomass-Derived Low-Cost Adsorbents

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More than a billion people in developing nations lack access to clean water, and this problem affects the industrialized world as well. Wastewater from businesses like tanning and plastics contains harmful colors that need to be treated to remove their color. Adsorption and coagulation are the two most popular techniques for eliminating color from wastewater. Because they are made from agricultural waste, natural adsorbents and coagulants are inexpensive and environmentally benign. They may be adjusted to remove dye quickly. Because they may achieve comparable levels of removal effectiveness and are both biodegradable and reusable, natural adsorbents and deflocculants are more environmentally friendly than synthetic compounds like alum and activated carbon. Combining the two methods would allow faster removal of dye and the reduction of dose of coagulant and adsorbent required. The effectiveness of the natural agricultural adsorbents and coagulants being used already is the aim of the analysis taking into account their abundance and their pro-environment approach. In studying the joint effect of the coagulation/ flocculation and adsorption treatment sequences in the removal process of dyes by use of adsorbents composed of agricultural wastes and the coagulant chemicals, it is also aimed at contributing something unique to knowledge. It is found out that Methylene Blue and Congo red were the dyes most often tested to be removed, whereas banana, orange as well as nut peels were used as adsorbents. More to that, both single and combination systems apply Moringa oleifera as a coagulant. It happens that Methylene Blue and Congo Red were most commonly experimented removals with and banana, orange and nut peels as adsorbents. Moreover, similar to single systems, the Moringa oleifera is used as a coagulant in combination systems too. Concerning adsorption, banana peel was discovered to possess impressive adsorption capabilities in the removal of different dyes.

P-36. Ionic Liquid: Green Solvent for The Synthesis of Cellulose/Guar Gum/PVA Biocomposite

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In recent years, the development of clean, efficient and environmentally friendly chemical processes using less hazardous chemicals has been one of the main goals of researchers. Green chemistry and sustainability are directing the development of the next generation of biocomposite materials and products. Herein, the authors use the ionic liquid 1-butyl-3-methylimidazolium chloride ([BMIM]Cl) as a green solvent for the synthesis of biodegradable, biocomposite materials from cellulose (microcrystalline cellulose (MCC)), guar gum (GG) and poly(vinyl alcohol) (PVA). The effect of GG and PVA composition with MCC was evaluated by comparing the physical, chemical and mechanical characteristics of the produced biocomposite films with those of the regenerated cellulosic film. The tensile strength and hardness of biocomposite films is superior to that of the regenerated cellulosic film. In this method, [BMIM]Cl has been used as a solvent to dissolve and synthesize the MCC/GG/PVA biocomposite material. [BMIM]Cl is removed from the biocomposite material by washing it with ethanol and recovered by using a rotary evaporator. The synthesized biocomposite is an advanced biomaterial with several potential applications in packaging and other fields.

P-37. Synthesis and Characterizations of Titanium Dioxide Nanoparticles: A Multidisciplinary Approach for Welfare of Society

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The present study describes the development of a nano-TiO2 based composite of starch-co-poly(acrylamide) copolymer. The graft copolymer was characterized by Fourier transform infrared (FT-IR), thermal gravimetric analysis (TGA), scanning electron microscopy (FE-SEM), and X-Ray Diffraction (XRD) confirmed that acrylamide (AM) was grafted onto starch successfully. The effects of pH, initiator dosage, temperature, and time on grafting percentage (GP) and grafting efficiency (GE) were also investigated. The synthesized TiO2 nanoparticles have successfully enhanced the thermal and biological properties of a native copolymer which was confirmed by TGA and biological assay. This synthesized nanocomposite starch-co-poly(acrylamide) was used as a superabsorbent polymer (SAP) with great thermal property and antibacterial activity which regulates the growth of the plant. With this synthesized nano-TiO2 of can employed in society to control mosquito larvae which show very good ant larvicidal activity against the material vector.

P-38. Iron Oxide Magnetic Nanoparticles: A Boon for Pharmaceutical Applications

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A Very fine nanosized metal oxide, namely, iron oxide has been synthesized by precipitation method using ammonia as precipitating agent and characterized by using XRD (X-ray diffraction), TGA/DTA, surface area measurement (FE-SEM), and magnetic measurements techniques. Magnetic measurements showed that iron oxide has five unpaired electrons and is ferromagnetic in nature, Ms value being 1.7 emu/g. The particle size of the synthesized iron oxide was determined by FE-SEM. Over the years, many different iron oxide nanoparticles have been evaluated for a wide range of biomedical applications. The synthesized magnetic iron oxide nanoparticles have applications in pharmaceutical science, specifically for cell labelling, tissue repair, cancer treatment, immunotherapy, and stem cell therapy. More research in biomedicine should be conducted using different methods.

P-39. Antioxidant and Photocatalytic Activities of Co & Ni codoped CuO Nanoparticles Synthesized by Green Chemistry Approach

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In the present study green sustainable, simple and cost effective synthesis and determination of the antioxidant and photocatalytic activities of pure, doped and Co and Ni codoped CuO NPs have been reported. The FTIR spectra of all synthesized NPs showed bands in the metal sensitive region may be attributed due to M–O bond indicating the formation of metal oxide nanoparticles. The size and morphology of the nanoparticles were determined by P-XRD and FE-SEM studies respectively. Energy-dispersive X-ray analysis was used to determine the elemental composition of the nanoparticles. P-XRD results revealed that the particle size of synthesized nanoparticles exist in the nanometer range. The morphology of the pure CuO has been changed after codoping with Co and Ni as indicated by FE-SEM. Moreover, the radical scavenging activity of the prepared nanomaterials was evaluated using the DPPH method. The Co & Ni codoped CuO nanoparticles exhibited a higher antioxidant activity compared to pure and doped nanoparticles. The materials were applied as photocatalysts for methylene blue (MB) decomposition under ultraviolet (UV) visible light. Results showed that the photocatalytic decomposition follows the first-order reaction.

P-40. Antibacterial Applications of Schiff Base And It's Metal Complexes: A Comparative Study

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This study presents a comprehensive investigation of new heterocyclic Schiff base ligand furfuralidine-2-amino thiazole (FAT) synthesized by condensing furan-2-aldehyde with 2-aminothiazole using both conventional reflux and microwave-assisted methods. After that four metal complexes were prepared by reacting furfuralidine-2-aminothiazol (FAT) with cobalt(II) and nickel (III) chloride and sulphate salts. All compounds were characterized using melting point determination, TLC, elemental analysis, and FT-IR spectroscopy. Antibacterial activity of the ligand and their metal complexes have been screened by Disk diffusion method against two bacteria Staphylococcus aureus and Pseudomonas aeruginosa to access their biocidal potential. Microwave-assisted complexation consistently outperformed conventional methods with yields improving from 40-50% to 70-77% and reaction times reduced from 2 hours to 3.5-4.5 minutes. Microwave synthesis demonstrated superior efficiency, achieving 88% yield in 3:15 minutes at 110W and 60°C compared to conventional synthesis yielding only 46% after 12 hours, while reducing solvent consumption from 50 ml to 15ml ethanol. This research establishes microwave-assisted synthesis as a highly efficient, environmentally sustainable alternative to conventional methods for preparing heterocyclic Schiff base and complexes, offering significant advantages in terms of reaction time, product yield, energy consumption, and waste reduction while maintaining superior product quality and purity. The antibacterial results also indicated that the metal complexes are better antimicrobial agents as compared to the Schiff bases.

P-41. Approaches Of Mathematical Modeling On Metastasis-A Review

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Cancer is one of the most threating diseases which are prevailing in the world, its fatal outcomes and dangerous side effects of the treatment are making lives miserable of the patients who are suffering from it, the condition becomes even more severe when it takes the form of metastasis. The metastasis spread is still not known much and the division of cells in microenvironment computational is vary rapid although attempts have been made to modeled the process mathematically and here we are trying to endlist and review all the possibly all the mathematical models and interferences which have been evolved till now.

P-42. A Mathematical Modeling Based Investigation on Cancer – A Review

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Cancer is one of the most threaten diseases which are prevailing in the world, its fatal outcomes and dangerous side effects of the treatment are making lives miserable of the patients who are suffering from it, and the condition becomes even more severe when it takes the form of metastasis. The using of mathematical modeling we can studies several parameters which help to prevent the cancers, So there are many variables that are involved in this complex disease, there are a number of attempt to view this disease and its dynamics from the different aspect and till date many mathematical models have been evolved to express the complicities modeling of metastatic method. Here, we have been made an attempt to trying ending list and reviewing possibly all the mathematical models and interferences are evolved till now.

P-43. Development of a MATLAB Program for Generalized Mie Theory in Photonic Nanojet Simulations

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Over the past decade, extensive research has been conducted on photonic nanojets (PNJs) due to their exceptional properties, including sub-diffraction focusing and strong field enhancement. PNJs are generated when a dielectric microsphere or microcylinder is illuminated by a plane wave or a structured light source, such as a Gaussian beam. PNJs have been widely utilized in various applications, including the enhancement of Raman scattering, fluorescence correlation spectroscopy, two-photon absorption, nano-photolithography, data storage, improved throughput of AFM probes, and waveguiding applications. In this paper, we present a MATLAB program developed for simulations based on Generalized Mie Theory (GLMT). This program enables the calculation of scattering intensities I1 and I2 with angular distribution for a microsphere. Additionally, another program has been developed to simulate the electric field profile around the microsphere.

P-44. Green Construction through Recycled Aggregate Concrete Utilization

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Concrete is the most widely utilized construction material worldwide; however, its high cement consumption contributes significantly to global carbon dioxide emissions. Recycling demolished concrete as coarse aggregate provides a sustainable alternative to reduce environmental impact and conserve natural resources. This study examines the mechanical properties, durability, and structural applications of recycled aggregate concrete (RAC). Experimental results reveal that the 28-day compressive strength of RAC with 50% recycled aggregate achieved 92% of that of conventional concrete, demonstrating its structural viability. Although workability decreased by 8–10% due to the porous nature of recycled aggregates, this drawback was effectively mitigated with the addition of 10% fly ash, which also enhanced overall performance. Furthermore, incorporating supplementary cementations materials such as fly ash and silica fume not only improved strength and durability but also resulted in a 25% reduction in CO_2 emissions compared to conventional concrete mixes. These findings confirm that RAC is suitable for a range of applications, including road pavements, low-rise structural elements, and non-structural components. Beyond technical feasibility, the adoption of RAC promotes circular economy practices by minimizing waste disposal, lowering construction costs, and addressing challenges related to rapid urbanization and resource scarcity. Overall, this study emphasizes that RAC is both a viable and eco-friendly alternative to conventional concrete, paving the way for sustainable and greener infrastructure development.

P-45. Predicting Human Cognitive Performance in Safety-Critical Industries Using EEG and Machine Learning

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Ensuring reliable human performance in safety-critical industries such as aviation, nuclear power, and mining requires an accurate understanding of workers' cognitive capacity. This study presents a predictive framework for assessing upcoming task performance using electroencephalography (EEG) signals. EEG data were collected from participants in controlled idle and task-based sessions, focusing on attention and working memory. Features extracted from EEG (frequency band powers) and eye-blink dynamics were combined with task performance metrics (reaction time, accuracy, success rate). Machine learning models—including k-nearest neighbours (KNN), decision trees, support vector machines (SVM), and artificial neural networks (ANN)—were developed and evaluated. The results demonstrate that decision tree models performed best for attention prediction (accuracy = 83.47%, F1 = 0.89, AUC = 0.83), while ANN achieved the best results for memory prediction (accuracy = 83.90%, F1 = 0.89, AUC = 0.89). These findings highlight the potential of EEG-based predictive models to improve safety and efficiency in high-risk industries.

P-46. Analysis of Heat Transfer Influenced by Internal Heat Generation and Absorption over an Oscillatory Stretching Surface

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The dynamics of non-Newtonian liquid motion over a flexible surface are of practical importance in manufacturing sectors, notably in plastic extrusion and film production. In this context, the present work examines the influence of endothermic and exothermic chemical reactions on Maxwell-type liquid flow over an oscillating stretchable sheet embedded in a porous medium. Such studies help researchers and practitioners refine process efficiency by tailoring flow parameters to promote favorable chemical and thermal outcomes. To facilitate analysis, the governing partial differential equations are reformulated into dimensionless form through the application of similarity transformations. The dimensionless equations are solved computationally using a Runge Kutta 4 th scheme for accuracy and efficiency. The findings reveal that an increase in activation energy or unsteadiness parameter leads to a reduction in the thermal profile. Additionally, the temporal variation of velocity under the combined effects of Maxwell and unsteadiness parameters is examined. The results confirm that stronger chemical reactions contribute to higher thermal profiles. However, higher unsteadiness and activation energy parameters reduce the overall thermal distribution. A noticeable fall in concentration occurs when both the chemical reaction parameter and oscillation-to-stretching ratio are enhanced.

P-47. Numerical solution and statistical optimization of Casson fluid flow over a non-linear expanding surface with new sets of similarity transformations

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This work explores the application of similarity transformations to reduce complex partial differential equations into ordinary differential equations for the analysis of nanofluid flow and heat transfer. The study is devoted to the flow of a Casson nanofluid over a nonlinear stretching sheet, where the additional influences of thermal radiation and an internal heat source are incorporated to capture more realistic physical conditions. A novel similarity transformation is formulated, with the similarity variable defined in a fully dimensionless manner while accounting for all independent parameters governing the system. The transformed model equations are solved numerically using the MATLAB bvp4c solver, which provides accuracy and computational stability for strongly coupled nonlinear problems. To further enhance the understanding of heat transfer performance, Response Surface Methodology (RSM) is applied to optimize the governing parameters, while Analysis of Variance (ANOVA) is used to statistically evaluate their significance. The findings reveal how radiation, heat generation, and Casson fluid properties significantly alter the velocity, temperature, and concentration profiles. Moreover, optimization through RSM highlights the parameter conditions that maximize the heat transfer rate. Overall, the present study combines rigorous numerical simulation with statistical optimization to deliver novel insights into Casson nanofluid transport over nonlinear stretching surfaces under complex thermal conditions.

P-48. Flow of hybrid nanofluid over a twisted porous cylinder under the effects of MHD and heat transfer under radial point stagnation flow conditions with supervised ANN

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Application of hybrid nanofluid in engineering field is crucial in the present day. This study investigates the heat transfer rate and magneto MHD flow over a twisted porous cylinder. The hybrid nanofluid employed is Cu-Al2O3 with base fluid water, this study also emphasizes the enhanced properties of hybrid nanofluid over a mono nanofluid. The boundary layer equations are transformed and reduced to a set of ordinary differential equations using a set of similarity variables. The key parameters- magnetic parameter, nano particle volume fraction, radiation parameter etc. are analysed numerically on the velocity and temperature profile in bvp4c and to facilitate the quick prediction of flow and temperature responses across the parameter space, we concurrently create a supervised Artificial Neural Network (ANN) surrogate that has been trained on high-fidelity bvp4c solution data. The ANN simulates the numerical solver and enables quick evaluation of derived engineering characteristics like skin-friction and Nusselt number. The combined approach of numerical and ANN provides a pathway for feasibility of hybrid nanofluid in complex engineering problems

P-49. Optimization of Solvent Free Hydroformylation of 1-Hexene over Heterogeneous Rhodium-Hms Catalyst at Laboratory Scale

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Hydroformylation is one of the important reactions among the homogenously catalyzed reactions practiced in industries for the production of aldehydes from synthesis gas, in industries at commercial scale. However even though homogeneous catalysts, give higher conversion, selectivity and turn over frequency, these lack efficient recycling of the valuable catalyst. Compared to homogeneous catalysts, heterogeneous catalysts without solvent, offer the potential advantages of easy separation and recycling of catalyst and easy purification of the products. With this concern , a Rh-complex, HRhCO(PPh 3) 3, encapsulated into the pores of hexagonal mesoporous silica (HMS) designated as Rh-HMS, was effectively investigated as a heterogeneous catalyst for solvent free hydroformylation of 1-hexene, to scale up the reaction system at laboratory scale in a high pressure auto clave reactor. All the high-pressure reactions were done in a high-pressure laboratory specially made for conducting experiments at high pressure and temperature. The reactor was kept in a fume hood equipped with a strong exhaust. The catalyst was characterized for it`s structural and textural properties, which were analysed by P-XRD, 31 P-NMR, FT-IR, SEM and surface area measurements. Solvent free heterogeneous reaction was greener and avoid the use of solvent which eliminate the use of post reaction workup. Under the investigated employed reaction conditions 1-hexene was found to work effectively as substrate and solvent. Parametric optimization was carried out by varying the substrate concentration, catalyst amount, total pressure, partial pressure of H 2 and CO and temperature. The hydroformylation was found to be dependent on all these parameters. The best performance was observed under the employed optimising reaction conditions, with 40 g of 1-hexene with 0.5 g catalyst, 40 bar syn gas at 80 o C for 12 h with agitation speed of 950 rpm. Hydroformylation gave 83% conversion with 79% selectivity to aldehydes and a good n/iso ratio of 2.56.

P-50. New azo Schiff bases compounds and their antibacterial and antifungal activities

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Schiff bases compounds are important intermediates for the synthesis of some bioactive compounds such as β-lactams. Furthermore, they are reported to show a variety of interesting biological actions, including antibacterial antifungal, anti mouse hepatitis virus (MHV), inhibition of herpes simplex virus type 1 (HSV-1) and adenovirus type 5 (Ad 5), anticancer , anti mosquito larvae and herbicidal activities. It is also known that the presence of a chloro and an azo moiety in different types of compounds can lead them to exhibit pesticidal activity. Some azo compounds synthesized by Jolly and coworkers have shown good antibacterial activity. Both Schiff bases and azo compounds are important structures in the medicinal and pharmaceutical fields. Ten new azo Schiff bases compounds 5a-h and 7a-b were prepared in excellent yields via the condensation of different aromatic amines and a new azoaldehyde, 2-hydroxy-3- methoxy-5-(4-methoxyphenylazo)benzaldehyde (4) by two different methods. All new compounds were tested against five microorganisms: *Staphylococcus aureus* (Gram positive and methicillin resistant), *Bacillus subtilis* (Gram positive), *Kelebsiella pneumonia, Pseudomonas aeruginosa* and *Escherichia coli* (all Gram negative). Compounds 4, 5a, 5c, 5d and 5g were moderately active against *Staphylococcus aureus* and *Bacillus subtilis*. Compound 7b was highly active against *Bacillus subtilis* and moderately active against *Staphylococcus aureus*. Other compounds were inactive against these strains of bacteria. The antifungal activities of these compounds were also tested against eight different fungal species. None of them were active against the fungi species tested.

P-51. Sustainable E-Waste Management through Smart Electronics Design and Disposal

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Rapid technological advancements and rising electrical and electronics equipment use have led to an extraordinary increase in trash from electronic devices, or "e-waste." It essentially consists of all electrical and electronic devices that are no longer in use because of new competitors entering the market or because consumer preferences or choices have changed. The amount of this trash is expected to keep increasing as new developments accelerate the replacement of outdated technology. It is a serious threat to public health and the environment. Both hazardous materials and valuable resources can be found in these discarded goods. Furthermore, incorrect disposal of these materials may release toxic substances into the environment, contaminating the air, water, and soil, which may have a direct or indirect impact on human health. However, e-waste presents a unique opportunity as well. Concerns about sustainability have led to an increase in the focus on eco-design and green manufacturing techniques, which aim to produce eco-electronic products with longer sustainable life cycles, fewer or no hazardous components, and safe recycling outcomes. The goal of the current project is to use smart electronics design and disposal to manage electronic trash in an environmentally sustainable manner. This study will not only advance academic understanding of E-waste but also offer practical recommendations for policymakers, manufacturers and recyclers, helping to address the environmental issue posed by the relentless growth of electronic waste. Highlights Amount of waste generated from electronics estimated to hit 74.7 Million tons by 2030. Sustainable development as well as sustainable disposal can help to contribute to a more circular or green economy

P-52. Green Approach to Wastewater Treatment: Eco-Friendly Photo Catalysis of Dye Pollutant as p-Nitro Aniline Using ZnO and H_2O_2

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Dye photo degradation is a possible method to treat industrial wastewater because of the low cost, environmental friendliness and the absence of a secondary contamination. The technique illustrates how charge carriers and reactive radicals can be generated under the influence of light, non-selectively oxidize a variety of organic dyes to provide direct photo degradation or a sensitized degradation protocol to convert organic dyes to water and carbon dioxide, among other things. The initial dye concentration, the solution pH, reaction medium temperature, light intensity are the operational parameters that govern the adsorption and photo degradation of dye molecules and have a direct influence on overall performance of the photo catalysis system. In addition, charge-carrier characteristics of the photo catalyst also largely influence production of reactive species in the heterogeneous photo degradation. The charge carrier properties of the photo catalyst and the functionality aspects of the operation on photo degradation of either the cationic or the anionic dye molecule are also deeply analyzed. This study offers useful recommendations that could be used to promote the establishment of effective photo degradation systems by revisiting past research, to come up with effective active species to facilitate photo degradation reaction and optimal conditions applicable in photo degradation.

P-53. Soil Health to Human Health: Fundamentals o f Biochar as A Soil Amendment Tool Used in Sustainable Agriculture

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The most important one is soil as it contains a good number of nutrients and microflora. This has been brought about by the rapid degradation of farmlands and the condition of farmlands by the ever-increasing population coupled with excessive application of chemical fertilizers. The reorientation has to be done urgently to ensure that there is sustainable production of farm crops. These are the hard, carbon-stuff which is produced through the pyrolysis of various kinds of biomass. Several studies have already reported on the possibility of increasing agricultural output and crop growth through the usage of biochar. In this paper, the paper merely sums the properties of biochar, the way it responds to the soil micro flora and also the way these biochars are in the process of improving the growth of plants, once they are injected into the soil. Much attention is drawn to biochar which is being utilized in converting land surfaces into enhanced scope and land sequestration of carbon. The identified effects depend on its chemical, physical and biological properties which include large surface area, CEC (Cation Exchange Capacity) large water-holding capacity, pore size, pore volume, pore distribution, and elemental composition and all these properties have impacts on microbial community where it is used. They exist in compositing, agricultural lands, and remediated lands. The aim of this paper is to present facts about the definition of the biochar, its potential ability to be made out of soil and the scientific basis of making use of biochar in different kinds of soil so as to get high yield and high quality crops.

P-54. Electrochemical Sensor for the Detection of Environmental Pollutant Bisphenol-A Using CdO/CuO Nanocomposite Modified Carbon Paste Electrode: A Voltametric Study

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Bisphenol A (BPA) is a harmful chemical that can disrupt hormones and is commonly found in food and drink packaging, from where it enters food and the environment. In this study, CuO/CdO nanoparticles were made using the co-precipitation method and used to improve the sensitivity of a modified carbon paste electrode (CuO/CdO-MCPE) for detecting BPA. The nanoparticles were studied using X-ray diffraction, field emission scanning electron microscopy, and energy-dispersive X-ray spectroscopy. Electrochemical techniques such as cyclic voltammetry (CV) and differential pulse voltammetry (DPV) were applied. The results showed that the electrode works through an adsorption-controlled process, with equal transfer of protons and electrons. The electrode was also able to detect BPA and catechol simultaneously in mixtures. The limit of detection (LOD) and limit of quantification (LOQ) for BPA were found to be 0.589 µM and 1.964 µM, respectively. However, the stability of the electrode decreased after 25 cycles.

P-55. Simulated Performance Enhancement of Lead-Free Perovskite Solar Cells Using a Zirconia Buffer Layer

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Perovskite solar cells (PSCs) are considered promising photovoltaic devices because of their excellent optoelectronic properties. However, the toxicity of lead-based absorbers limits their large-scale use. In this study, lead free perovskite solar cell incorporating a zirconia (ZrO2) interfacial buffer layer is designed and simulated. The high-k dielectric property of ZrO2 allows for favorable band alignment in the ITO/SnO2/ZrO2/lead-free perovskite/NiOx/Au structure, thus improving charge transport and reducing interfacial recombination. Numerical simulations demonstrate that incorporating ZrO2 significantly enhances device performance, leading to higher power conversion efficiency, improved fill factor, increased open circuit voltage, and enhanced short-circuit current density. Analysis of carrier generation–recombination dynamics also illustrates ZrO2's role in suppressing nonradiative pathways and stabilizing interfacial energetics. These findings emphasize the potential of high-k buffer layers for realizing efficient, lead-free, and environmentally sustainable perovskite photovoltaics.

P-56. Clustering and symplectic symmetry based shell model approach in atomic nuclei of many body nuclear system

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A new symplectic-based shell-model approach to clustering in atomic nuclei is proposed by considering the simple system 20Ne. Its relation to the collective excitations of this system is mentioned as well. The construction of the Pauli allowed Hilbert space of the cluster states with maximal permutational symmetry is given for the 16O + 4He → 20Ne channel in the case of one component many particle nuclear system. The equivalence of the obtained cluster model space to that of the semi microscopic algebraic cluster model is demonstrated.

P-57. Smart Methane Sentinel: A Flexible Low-Dimensional $ZnO–SnO_2$ Nanocomposite Sensor for Early Gas Leak Detection

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Methane, a highly explosive greenhouse gas, poses serious safety and environmental challenges due to its silent leakage from pipelines, refineries, and industrial infrastructure. Traditional MOS-based methane sensors require high operating temperatures, consume significant power, and fail to detect trace concentrations below 1 ppm. We present a novel $ZnO–SnO_2$ nanocomposite sensor embedded in a polyacrylamide (PAM) matrix, optimized for sub-ppm methane detection at near-room temperature. The heterojunctions between ZnO and SnO_2 nanostructures facilitate enhanced electron transport, while the PAM matrix prevents agglomeration, increases gas diffusion pathways, and enables mechanical flexibility. The sensor demonstrates sub-ppm sensitivity, high selectivity against interfering gases, rapid response (8–15 s) and recovery (10–18 s) times, low drift, and long-term stability. This "Smart Methane Sentinel" operates at low power, integrates seamlessly with IoT systems, and is suitable for wearable, portable, and pipeline-mounted configurations. Its scalable design supports deployment across oil & gas facilities, petrochemical plants, and urban infrastructures, contributing directly to industrial safety and global methane mitigation strategies.

P-58. Synthesis and characterization of liquid crystal compounds and complexes (metallomesogens)

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Methylbenzoxazole derivatives HLn (n = 10, 12, 14), and their copper (II) complexes had been synthesized as liquid crystal material; elemental analyses and a variety of spectroscopic techniques were used to determine the molecular structures of all the organic compounds and the metal complexes. X-ray diffraction studies, DSC analysis, and POM observation were used to examine thermotropic characteristics. The enantiotropicsmectic-A (SmA) mesophase is present in every member of the sequence. According to DFT simulations, the ligand HLn (n = 12) and its copper (II) complex have stable electronic structures. Alkoxy-derivatives of the HLn class of methyl-substituted benzoxazolemesogens were produced. It was discovered that every molecule was mesogenic, which is a feature of the enantiotropic SmA phase. The resulting square planar copper (II) complexes of all the ligands retained SmAmesophase upon coordination to the copper (II) metal ion, and their isotropic temperatures were found to be greater.

P-59. Decontamination of Cu (II) ion by Employing Activated Waste of Rubia Cordifolia Biomass from Aqueous Solution

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A series of bulk laboratory experiments were conducted in this study to investigate the feasibility of Rubia cordifolia based activated carbon (RC-AC) for the adsorption process of Cu (II) removal from aqueous solutions. In this research work, raw material was treated with phosphoric acid (H3PO4) for chemical activation and after multiple washing it underwent pyrolysis for physical activation in a muffled furnace for the preparation of activated carbon. Active functional groups present in the activated carbon were analysed by Fourier Transform Infrared Spectroscopy (FTIR) characterization. scanning electron microscope (SEM) and Brunauer-Emmett-Teller (BET) analysis of prepared activated carbon were also carried out. The effect of solution pH, adsorbent dose, initial Cu(II) ion concentration, contact time, temperature and coexisting ions on Cu(II) adsorption were all examined in this investigation. All batch experiments were carried out with the help of mechanical rotatory shaker. Equilibrium results obtained were analysed by using various adsorption and isotherm models. It was found that maximum decontamination capacity (qmax) of RC-AC was 1.57 mg/g and optimum pH found was 5. Pseudo second order model and Langmuir adsorption isotherm was best fit for Cu(II) adsorption on RC-AC. Temperature effect on metal adsorption was also performed and thermodynamic study was also taken into consideration. Endothermic character of Cu (II) adsorption onto prepared activated carbon is revealed by thermodynamic investigations. The paper offers a straightforward method for using biomass material in a way that adds great value later on.

P-60. Structure and Dynamics of Ionically Crosslinked Low Methoxyl Pectin (LMP)Hydrogels: Effect of Ca2+ and Fe3+ ions on Rheological and Dielectric Relaxation Behaviour

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Investigations on structure and dynamics of LMP based ionically crosslinked hydrogels important for designing multifunctional materials for applications in energy storage devices. Low Methoxyl Pectin (LMP) solutions were prepared using solution casting technique. Stoichiometric ratios (SR) of 0.5, 1, 1.5 and 2 were selected for Ca2+ and Fe3+ ion doping. Rheology, electrochemical impedance spectroscopy (EIS), SEM studies were performed. The storage modulus (G') and loss modulus (G") with Ca2+ and Fe3+ ions showed a power law relationship, which are in good agreement to morphological changes in hydrogels. Rheology results showed a power law relationship with increasing Ca2+ and Fe3+ ion concentration. LMP/Ca2+ hydrogels showed dc conductivity (0.38 S/cm-1.26 S/cm), whereas LMP/Fe3+ hydrogels (0.37 S/cm–0.81 S/cm). Kramer's Kronig relation was used to derive imaginary part (ε"der) of permittivity to avoid conductivity contributions. Debye model function was used for fitting dielectric relaxation (segmental relaxation) peak. The dc conductivity of LMP was ≈1.52 S/cm with dipolar relaxation time of ≈1.95×10-4 s. Dielectric relaxation times were (1.9 ×10-4– 7.1×10-4) for LMP/Ca2+hydrogels, whereas, greater change (7.9 ×10-4– 2.5×10-3) in relaxation time was observed for LMP/Fe3+ hydrogels. Electrode polarization was higher for LMP/Fe3+ over LMP/Ca2+ hydrogels, which can be used in energy storage devices.

P-61. MXene Synthesis and Electrochemical Investigation for Hydrogen Evolution Reaction Application

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The enormous surface area, variable surface chemistry, and exceptional electrical conductivity properties of two-dimensional transition metal carbides and nitrides, known as MXenes, have emerged as promising candidates for energy-related applications. In this study, through a selective chemical etching process using hydrofluoric acid (HF) of titanium based MAX phase precursor Ti_3AlC to synthesize MXene ($Ti_3C_2T_x$). The transformation from MAX to MXene was confirmed through X-ray diffraction (XRD) analysis, which showed the characteristic peak shift and disappearance of the Al-layer peak, indicating successful etching. Furthermore, field emission scanning electron microscopy (FESEM) revealed the layered, accordion-like morphology typical of delaminated MXene structures, supporting the XRD findings and confirming the formation of the desired 2D material. The electrochemical performance of the synthesized MXene was investigated for the hydrogen evolution reaction (HER) in basic (KOH) media using a standard three-electrode system. Linear sweep voltammetry (LSV) results demonstrated promising catalytic activity, with low over potentials and a favorable Tafel slope, suggesting efficient HER kinetics. The excellent performance is attributed to the high conductivity and active surface sites provided by the MXene structure. This work highlights the potential of HF-etched MXene as a cost-effective and efficient electrocatalyst for HER, contributing to the development of sustainable hydrogen production technologies. Further optimization of synthesis conditions and surface functionalization is expected to enhance catalytic activity and long-term stability.

P-62. Delonixregia flower extract mediated Green synthesis of Ag capped TiO2@ZnO Nanocomposites for electrochemical detection of Bisphenol-A

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The synthesis of trimetallic nanoparticles has garnered significant attention due to their wide-ranging applications across various industries. In the present investigation, trimetallic nanoparticles (silver-capped TiO_2@ZnO NPs) have been produced using an environment friendly method involving Delonixregia (gulmohar) flower extract. The process involved modifying TiO_2@ZnO nanoparticles by incorporating silver nanoparticles (AgNPs) under magnetic stirring for 12 hr at 400 rpm. This biological synthesis approach offers numerous advantages, including simplicity, speed, efficiency, scalability, and eco-friendliness. It also minimizes chemical toxicity to the environment and yields stable nanomaterials through an easily scalable process. Initial confirmation of the trimetallic nanoparticles' formation is achieved through visual inspection, followed by advanced analytical techniques such as UV-visible spectroscopy, XRD, and FTIR. Further the samples are characterized for structural, optical, and morphological properties using energy dispersive X-ray spectroscopy (EDs), transmission electron microscopy (TEM), and field emission scanning electron microscopy (SEM). For electrochemical analysis, the synthesized nanoparticles are electrodeposited onto hydrolyzed ITO using the electrophoretic method. The resulting modified electrode has been further enhanced with laccase enzyme to improve its specificity and selectivity for bisphenolA detection. This research combines the advantages of biologically synthesized materials with enzymatic modification to enhance the electrochemical sensor's sensitivity, resulting in an eco-friendly and rapid biosensor for real-world bisphenolA detection.

P-63. Fine Structure Study of 1-8, 2-6 and 3-4 Bands of $B^3 \sum^-(0^+) - X^3 \sum^-(0^+)$ Transition of the 78Se2 Molecule

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The Fourier Transform high resolution emission spectrum of $B^3 \sum^-(0^+) - X^3 \sum^-(0^+)$ transition of isotopic species $^{78}Se_2$ excited in an electrodeless discharge tube (EDL) by microwave, has been recorded in the spectral region 18,000 – 26000 cm^{-1} at an apodized resolution of 0.035 cm^{-1}. The rotational analyses of the 1-8, 2- 6 and 3-4 bands have been performed. The improved rotational constants have been reported by analyzing the 2-6 band for the first time.

P-64. Microwave Assisted Synthesis of Undoped and Zirconium Doped Tio2 Nanoparticles and Photocatalytic activity in Degradation of Organic Pollutants

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Zr-doped TiO_2 nanoparticles were synthesized at molar concentrations of 0.5% and 2%, and they were effectively employed as possible photocatalysts for the photocatalytic degradation of organic pollutants. Microwave assisted sol-gel synthesis was utilized to create the Zr-doped TiO_2 nanoparticles. Using 2-propanol and titanium tetra-isopropoxide as precursor materials, obtained the results of this study, which were then calcined at 650ºC - 700ºC to form the rutile phase. High resolution transmission electron microscopy (HRTEM), field emission scanning electron microscopy (FE-SEM) with energy dispersive X-ray spectroscopy (EDX) were utilized to characterize the crystalline structure, chemical valence states, and morphology of TiO_2 nanoparticles, X-ray diffraction (XRD), particle size analyser, raman spectroscopy, fourier transform infrared (FTIR) and X-ray photoelectron spectroscopy (XPS) analysis was employed to characterize the as-prepared samples. When TiO_2 nanoparticles were doped with Zirconium, their band gap energy was less than that of TiO_2. The size of the Zr-doped TiO_2 crystallite is likewise observed to be significantly smaller than that of the undoped TiO_2 crystallite. Because of their high specific surface area and low band gap energy values, the synthesized semiconductors would be very beneficial in photocatalytic applications. From the UV-visible measurement, the absorption in the visible light of the Zr-TiO_2 and as prepared TiO_2 was found to be improved and was shifted to longer wavelength. The obtained results show that the photocatalytic efficiency of Zr-TiO_2 was better than prepared TiO_2 for the photodegradation of organic pollutant.

P-65. Comparative Study of Biochermical Profiling of the Pulses by ATR-FTIR Spectroscopy

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Pulses are a rich source of phytochemicals that have immense importance in human diet providing all nutritional and physiological beneficial effects on human health. Commonly used pulses are dried legumes that consist of various varieties like yellow lentils (mung dal), chickpeas, red lentils (masoor dal), black lentil (kali masoor dal). In order to monitor the quality of pulses on the basis of the presence of biochemical, it is essential to make a comparative assessment using non-destructive, non-invasive, extraction free, cost-effective and rapid technique. The present study examines the potential of the attenuated total reflection Fourier transform infrared spectroscopy (ATR-FTIR) coupled with principal component analysis (PCA) as a non-destructive, non-invasive, rapid, cost-effective, multicompound and fast data generating technique for the phytochemicals profiling of the pulses. For this, infrared spectra of the chickpea, mung, black masoor, and red masoor have been acquired in the spectral region 485-4000 cm^{-1}. The analysis of the acquired spectra shows spectral profiles of the cellulose, hemicelluloses, protein, fatty acid, pectin and lignin with varying intensities of spectral profile peaks. The peak intensity of the spectral profile of the identified biochemicals has been used to compare the level of detected biochemicals in the different variety of pulses. The study/approach highlights the use of ATR-FTIR spectroscopy as a non-destructive, non-invasive, cost-effective, and rapid spectroscopic probe for the quality monitoring in the area of cereals like pulses.

P-66. Advances in Starch, Chitosan, and Cellulose-Based Graft Copolymers

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Synthetic and natural polymers have been used in wastewater treatment because of their merits but demerits did not gave proper outcomes so grafting of these polymers was initiated. Polysaccharides are natural polymers with versatile properties, starch, chitosan, and cellulose are the abundant one. Various synthetic techniques have been used in the synthesis of graft copolymers which is conform by using different characterization techniques such as FT-IR, NMR, SEM, TGA, XRD, intrinsic viscosity and GPC. There are many methods of wastewater treatment have been used amongst which flocculation is more approached one. Flocs formation, influencing factors in the process and mechanism involved during the whole process does have an impact on how graft copolymer work in jar test and settling test. The process of flocculation is perfect laboratory technique for wastewater treatment. Wastewater includes several toxic elements in it such as heavy metal ions, harmful dyes, mine industries discharge and many more. As this contamination poses a significant environmental challenge, necessitating effective wastewater treatment solutions. So a brief review has been presented in our review which deals with the sources of natural polymers, grafting of synthetic polymers onto them with various techniques and how they perform in wastewater treatment which includes treatment of several toxicity and wastage from water bodies. A brief highlights on how sustainable and versatile these graft copolymers can be by emphasizing their potential for large-scale applications and further advancements in synthesis techniques.

P-67. Heavy Metal Pollution in The Yamuna River: A Study of its Toxicological Effects

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The rivers of India are vital to the lives of the Indian people. Water is a crucial part of our daily lives, used for cleaning, drinking, washing, farming, and food production. However, industrial and urban activities have led to a significant increase in metal contamination within these rivers. The danger of heavy metal pollution is particularly concerning because these pollutants are not easily degraded and can accumulate in the ecosystem. This has created a serious global problem: the poisoning of aquatic ecosystems by heavy metals. Research and investigation have shown that the Yamuna River, in particular, is highly polluted due to the presence of many large cities and industries along its banks. The concentration of heavy metals like chromium (Cr), iron (Fe), and lead (Pb) is notably high in the river's surface sediment near Agra. Metals become enriched in the sediment through processes like absorption, flocculation, and co-precipitation. This has altered the physico-chemical properties of the Yamuna River's water, affecting both domestic and spatial variations. Heavy metals are fundamentally defined as metals with high densities, atomic weights, and atomic numbers. These metallic ions are referred to as heavy metals and are toxic in their natural state. One of the most persistent issues is the unchecked leaching of large amounts of heavy metals into water bodies from sewage water. This has led to widespread poisoning of the aquatic environment and poses significant health risks. Fish and other aquatic creatures are frequent victims of this poisoning. The use of heavy metals has been associated with a decline in fish and other water species. The toxic effects of any toxicant that enters the water can lead to a shift in the water bodies and may be determined by analyzing water-borne ailments in aquatic fauna. The current radical changes in aquatic contamination and their implications for human existence are a major concern.

P-68. Excitation of large amplitude lower hybrid wave by beating of two laser beams in spherical nanoparticles

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This work examines the excitation of a large-amplitude lower hybrid wave produced by the nonlinear interaction of two identical laser beams at their beat frequency in a plasma medium embedded with spherical nanoparticles. When the counterpropagating beams with slightly different frequencies interact with this medium, a beat wave is generated at the wave number $k = k_1 + k_2$ and beat frequency $= \omega_1 - \omega_2$. The intense radiation from these beams can have potential to ionize the nanoparticle atoms, transforming them into plasma plume balls. These plasma structures, rich in conducting surface electrons, experience significant nonlinear ponderomotive forces. Such forces are capable of driving space-charge oscillations, which, through cyclotron damping, become coupled with the electrostatic lower hybrid wave. Resonance occurs when the beat wave frequency approaches $1/\sqrt{3}$ of the electron plasmon frequency, leading to the excitation of a large-amplitude electrostatic lower hybrid wave. The strength of this excitation depends critically on the beam characteristics such as width, field strength, decentre parameter and medium properties, including electron–ion collision frequency, electron cyclotron frequency, nanoparticle radius, and interparticle spacing. Furthermore, an externally applied magnetic field enhances the amplitude of the electrostatic mode and regulates the coupling process. The resulting large-amplitude wave holds promising applications in energetic particle acceleration, higher harmonic generation, and effective electron heating.

P-69. Study of solar activities associated with Galactic Cosmic Ray Modulation

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Solar activities controls structure of the heliosphere and cosmic ray modulation. Coronal mass ejection (CME) are large scale magnetic- plasma ejection from solar corona to the heliosphere .They are mostly associated with x-ray solar flares. Necessary experimental data to study interplanetary transport of cosmic rays during transient events at different space / time scales, based on the observation from Omniweb data centre for Solar- interplanetary causes and yearly / monthly mean count rate of Cosmic Ray Intensity (CRI) variation data from Oulu / Moscow neutron monitors (Rc=0.81 GV & Rc=2.42 GV) . It is observed that the during minimum phase of Solar activity , the strength of the interplanetary magnetic field has been minimum , reduces the Galatic Cosmic Rays entering inner- heliosphere and high anti-correlation with solar activity indices. It is also found that velocity of solar wind (Vsw) and turbulence and strength of the interplanetary magnetic field were positive correlated and, inverse correlated with count rate of cosmic ray intensity.

P-70. Estimation of organochlorine pesticides residues in pumpkin (Cucurbita maxima) brinjal (Solanum melongena) cucumber (Cucumis sativus) ridge gourd (Luffa aegyptiaca) and apple gourd (Praecitrullus fistulosus)

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The continuous consumption of pesticide infected vegetables poses a major threat to public health. Gas chromatography coupled with electron capture detector was used to monitored the twenty organochlorine pesticides including isomers of benzene hexachloride (α-BHC,β-BHC,γ-BHC,δ-BHC), Heptachlor, Aldrin, Heptachlor epoxide, γ-Chlordane, α-Chlordane, Endosulfan- I, 4,4'-DDE, Dieldrin, Endrin, 4,4'-DDD, Endosulfan II, Endrin aldehyde, 4,4'-DDT, Endosulfan sulfate, Methoxychlor and Endrin ketone were monitored in five summer vegetables (pumpkin, brinjal, cucumber, ridge gourd and apple gourd). Pumpkin was found contaminated with γ-BHC, δ-BHC, 4,4'-DDE, Endosufan sulfate and Methoxychlor; Brinjal was found contaminated with 4,4'-DDE, Dieldrin, Endosufan sulfate and Methoxychlor; Cucumber was found contaminated with δ-BHC, 4,4'- DDE, Methoxychlor and Endrin ketone; Ridge gourd was found contaminated with δ-BHC, Heptachlor epoxide, 4,4'-DDE and Endosulfan sulfate; Apple gourd was found contaminated with Methoxychlor. However, the concentrations of detected pesticides were far below the maximum residue limit (MRL) values. The present results indicated the need for strict regulation and regular scrutinizing of banned pesticide residues in vegetables to protect consumer's health.

P-71. River Health Assessment of Paisuni River, Chitrakoot

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River health means the overall state of a river's ecosystem, including its physical, chemical, and biological features. Many factors affect river health, such as water quality, water flow, habitat condition, pollution, and invasive species. In this study, it was found that in all three seasons, the algal scores at most sites were in the "stressed" range, except at Sati Anusuiya, where the condition was rated as "excellent". An increase in biotic scores improves the River Health Index (RHI), which means better river health. At Ram Ghat, a large amount of sewage flows into the Paisuni River. This leads to lower dissolved oxygen (DO) and higher levels of biological oxygen demand (BOD) and fecal coliform (FC). These changes reduce the OEB group score, causing sensitive species to decrease and pollution-resistant species to increase. Pollution resistant species decrease biotic indices score which lowers RHI value, indicating deteriorating RHC.

P-72. Enhancing Mental and Brain Health via Engineering: Combining Clinical Cognition and Computation

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Mental and brain health are critical to human well-being, yet progress is often slowed by the separation of clinical practice, cognitive science, and technology. Engineering offers a unifying framework to bridge these gaps and enable innovative strategies for assessment, diagnosis, and intervention. This paper examines the potential of integrating clinical cognition with computational tools to improve mental and brain health outcomes. Advances in machine learning, neuroengineering, and computational modeling now make it possible to capture complex brain dynamics, detect early cognitive changes, and design personalized interventions. Grounding these technologies in clinical cognition ensures that they remain ethically sound, patient-focused, and clinically relevant. The convergence of engineering and healthcare is creating novel opportunities, such as wearable sensing systems, brain–computer interfaces, and intelligent decision-support platforms for clinicians. Case illustrations demonstrate how these approaches enhance diagnostic precision, optimize treatment pathways, and promote patient-centered care. Challenges including data privacy, cross-disciplinary integration, and system-level implementation are also considered. By combining engineering design principles with computational intelligence and clinical expertise, this work highlights a path toward more proactive, precise, and scalable solutions for advancing mental and brain health.

P-73. Efficacy of Methylammonium Iodobismuthate: A Green Catalyst for Reduction of Nitrate to Ammonia.

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Ammonia (NH3) plays a crucial role in agriculture and various industrial sectors; however, its conventional large-scale synthesis remains energy-demanding and environmentally detrimental. In this study, we present—for the first time—the development of a lead-free, non-toxic, hexagonal methylammonium iodobismuthate (MABI) metal halide perovskite as an efficient and sustainable electrocatalyst for green ammonia production via nitrate reduction. The MABI structure comprises isolated BiI6 octahedra stabilized by methylammonium cations, creating a tunable electronic configuration that facilitates nitrogen activation and hydrogenation. Combined experimental and theoretical analyses confirm the formation of a pure, interconnected hexagonal phase with a band gap of approximately 2.1 eV. Electrochemical investigations reveal that MABI achieves an impressive ammonia yield of 27.53 μg mg−1 h−1, excellent stability, and a notable Faradaic efficiency of 40%. This work underscores the potential of halide bismuthate perovskites as promising alternatives to conventional catalysts, enabling energy-efficient and environmentally benign ammonia synthesis under ambient conditions.

P-74. Quinoxaline-Linked Schiff Bases: Synthesis, Mesomorphic Behaviour and DFT

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Two series of homologous mesogenic Schiff bases that contain quinoxaline, 5-(alkyloxy)-2-((quinoxalin-6-ylimino) methyl) phenol (3a-b) and 3-hydroxy-4-((quinoxalin-6-ylimino) methyl) phenyl 4-(alkyloxy) benzoate (7a-b), were obtained and their molecular structural features confirmed through FT-IR, NMR, and Mass spectral techniques. These compounds were investigated to evaluate the mesophase properties and thermal behaviour using POM and DSC. Altering the spacer from an ester bonded structure to a non-ester bonded structure in the Schiff base contributes to improved thermal stability and higher mesophase transition temperatures. Compound 3b from Series I displays a monotropic nematic phase, whereas compound 3a exhibits an enantiotropic nematic phase. On the other hand, both the compounds in Series II demonstrate enantiotropic nematic behaviour. DFT-based calculations were executed to analyse structural and electronic characteristic of the all-synthesized compounds.

P-75. Enhanced power graph of non-abelian group of order p3 of exponent p2

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A graph with a vertex set G and two vertices u and v in G that are adjacent to each other if they are part of the same cyclic subgroup of G; this type of graph is called the enhanced power graph PE(G) of a group G. For the non-abelian group G of order p3 of exponent p2, where p is an odd prime, we obtained the metric dimension and the resolving polynomial of PE (G) in this article. The coloring and detour distance properties of the PE(G) are also examined.

P-76. Voltammetric Investigations of Industrially Important Organic Molecule @ Co3O4/Cuo Nanocomposite Carbon Paste Electrode

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A typical flavoring ingredient in the food and pharmaceutical industries is vanillin (VIN), significant effects on human health result from the extensive use of VIN. where a common coloring additive in a variety of meals and drinks is tartrazine (TZN). For the purpose of to enhance the bare carbon paste electrode's sensitivity for the TZN-related cyclic voltammetric (CV) examination of VIN, a Co_3O_4/Copper oxide (Co_3O_4/CuO/MCPE) modifier was added. To analyze Co_3O_4/CuO nanoparticles, X-ray diffraction (XRD), scanning electron microscopy (SEM), and energy dispersive X-ray spectroscopy (EDS) experiments were conducted. The cyclic voltammetric (CV) the approach that was employed was successfully used by the Co_3O_4/CuO MCPE to build electrochemical sensors that detect VINs. The pH, scan rate, concentration, interference, and stability are among the many parameters that are examined in electrochemical investigations. With the appearance of (TZN), the concurrent analysis of VIN was examined. VIN and TZN oxidation was adsorption or diffusion controlled, and the limits of detection and quantification have been determined to be 0.12 – 0.36 µM also 0.46 –1.36 µM, respectively. This insightful approach was effectively used to examine the presence of VIN through samples for consumption. The proposed electrochemical detection of VIN is highly promising with this modified electrode.

P-77. Sensing Performance of Fabricated Tungsten Trioxide WO3 Nano Material

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Tungsten trioxide has been widely studied in the field of sensing, supercapacitor and electrochromism due to their unique structure and properties. In the present work, we synthesized Tungsten trioxide (WO3) by sodium tungstate dehydrate and hydrochloric acid using sol-gel method and deposited thin film on soda-lime glass substrate. The crystalline nature and particle size of WO3 nano material were investigated by X-Ray diffraction. X-Ray Diffraction confirms the formation of tungsten trioxide nano material. Ultraviolet-Visible spectroscopy demonstrates the optical properties of WO3. The band gap of WO3 nano material obtained from UV-Visible was found in semiconductor range. The synthesized material shows excellent performance for sensing application.

P-78. Neutrino Tomography of Earth

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Neutrinos produced in cosmic ray interactions in the atmosphere provide a unique and independent probe to explore the internal structure and composition of the deep Earth, which is complementary to traditional seismic and gravitational measurements and would pave the way for multi-messenger tomography of Earth. I will discuss the two different approaches to perform Earth tomography with neutrinos: (i) neutrino absorption tomography, based on partial absorption of a high-energy TeV-PeV neutrino flux as it propagates through Earth and (ii) neutrino oscillation tomography, based on Earth matter effects due to the coherent forward scattering of multi-GeV neutrinos with the ambient electrons modifying neutrino oscillation patterns.

Abstracts

Biological Sciences

National Academy of Sciences, India

95th Annual Session

Indian Institute of Technology Guwahati

Invited Speakers

ILB1. Clinical & Molecular insights into Lead Toxicity

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Lead toxicity remains a critical public health issue, particularly in children, due to continued exposure from industrial emissions, contaminated water, and household sources. Clinically, lead affects multiple organ systems, presenting as cognitive and behavioral impairment, anemia, renal dysfunction, and hypertension. Beyond these classical effects, recent molecular research has highlighted lead's capacity to disrupt calcium signaling, induce oxidative stress, and impair mitochondrial function. Epigenetics have provided new insight into the lasting biological impact of lead exposure. Altered DNA methylation, histone modifications, and dysregulated microRNA expression have been linked to changes in gene regulation associated with neurodevelopment, oxidative balance, and inflammation. These findings suggest that epigenetic mechanisms may mediate the long-term and possibly transgenerational effects of lead. This presentation will summarize recent clinical and molecular advances in lead toxicity, emphasizing the emerging role of epigenetic biomarkers in early detection, risk assessment, and preventive strategies.

ILB2. Parkinson's disease: novel insights into the cellular alterations using a yeast model

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α-Synuclein aggregation is a hallmark of Parkinson's disease and several mutant variants of the protein associated with the disease have been identified. Interestingly, each variant exhibits variable localization, aggregation dynamics, toxicity and cellular alterations. Several cellular pathways such as ER-Golgi trafficking, proteostasis including autophagy and ubiquitin-proteasome system, vesicle trafficking and mitochondrial dynamics are altered in the disease condition. While the effect on mitochondria have been extensively studied, much less is known about peroxisomes, organelles that share functional similarities and coordinate with mitochondria to perform various functions of a cell. In this study, we investigated the effect of GFP-tagged α-Synuclein expression on peroxisome dynamics. Interestingly, expression of the disease-associated A53T α-Synuclein variant resulted in a significant increase in peroxisome number. This increase was independent of the division machinery of peroxisomes. In addition, increased catalase activity was also observed in these cells. However, no significant increase in peroxisome number was observed when similar experiments were performed using a less aggregation-prone variant of α-Synuclein (A29S). Interestingly, mitochondrial fragmentation was observed upon expression of A53T α-Synuclein but not the A29S variant. Our results also suggest a link between mitochondrial dysfunction and increase in peroxisome number via the retrograde-signaling pathway in the yeast PD model.

Keywords: α-Synuclein; yeast; peroxisome; mitochondria; Parkinson's Disease

Accepted Abstracts

B-1. Effects of Integrated Plant Nutrient Supply System (Ipns) on Growth, Yield and Performance of Rice (*Oryza sativa* L.)

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The Integrated Plant Nutrient Supply System (IPNS) offers a sustainable approach to enhancing crop productivity by combining organic, inorganic, and biological sources of nutrients. This study investigated the effects of IPNS on the growth, yield, and overall performance of rice (*Oryza sativa L.*) under field conditions. A field trial was conducted at agriculture research farm of Shri Durga Ji Post Graduate College, Chandeshwar, Azamgarh during *kharif* season of 2024-25 under randomized block design with multiple treatment combinations including chemical fertilizers, farmyard manure, green manure, and biofertilizers. Key growth parameters such as plant height, tiller number, and leaf area index were measured, along with yield attributes like panicle length, grain number, and grain yield. The results suggested that IPNS significantly enhanced vegetative growth and yield attributes when compared to sole chemical fertilizer application. Among the treatments, the integration of 50–75% recommended dose of fertilizers (RDF) with organic and biological inputs yielded the best performance in terms of productivity and nutrient use efficiency. The findings underscore the potential of IPNS in achieving sustainable rice production by improving crop yield and maintaining soil health. The study concluded that IPNS not only enhances rice yield but also contributes to soil health and long-term sustainability, making it a viable strategy for integrated nutrient management in rice cultivation.

B-2. In Silico Identification of Novel Acetylcholinesterase Inhibitors for Alzheimer's Disease Using Integrated Docking, ADMET, and Molecular Dynamics Approaches

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Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by cognitive decline, in which acetylcholinesterase (AChE) plays a crucial role by accelerating the breakdown of acetylcholine and aggravating cholinergic deficits. Current AChE inhibitors, though clinically useful, often exhibit limited efficacy and adverse effects, underscoring the need for safer and more potent alternatives. In this study, an in silico drug discovery approach was employed to identify novel inhibitors targeting AChE. A virtual library of 250 previously untested small molecules was systematically screened against the crystal structure of AChE (PDB ID: 2ACE). The workflow included initial toxicity and ADMET predictions, followed by molecular docking using AutoDock and GLIDE to evaluate binding affinity and interaction profiles. Compounds displaying superior docking scores compared to the standard inhibitor were subjected to molecular dynamics (MD) simulations for 50 ns to assess structural stability and binding persistence within the active site. Energy minimization and stabilization analyses further validated complex integrity. From this screening pipeline, six compounds emerged as promising candidates, exhibiting favorable pharmacokinetic properties, non-toxic profiles, and enhanced binding affinities over the reference ligand. MD trajectories revealed stable hydrogen-bonding and hydrophobic interactions critical for inhibitory activity. Collectively, these findings highlight the therapeutic potential of these novel scaffolds as AChE inhibitors and provide a foundation for further preclinical exploration. This computational strategy not only accelerates the identification of lead molecules but also underscores the utility of integrating ADMET, docking, and MD simulations in rational drug design for Alzheimer's disease.

B-3. Mitochondrial and Neurochemical Alterations in the Hippocampus Following Combined Exposure to Cadmium and Lead in Rats

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The hippocampus, essential for memory, learning, and emotional regulation, is particularly sensitive to toxic environmental agents. Heavy metals like cadmium (Cd) and lead (Pb) are known neurotoxicants. This study investigates their combined effects on hippocampal structure, oxidative stress, neurotransmission, and membrane-bound enzymes, particularly acetylcholinesterase (AChE). Adult male rats were intraperitoneally exposed to Cd and Pb for 21 days. Post-exposure, hippocampal tissue was analyzed for oxidative stress markers (MDA), antioxidant enzymes (SOD, CAT), AChE activity, mitochondrial respiratory function (Complex I and IV), serotonin levels, and histopathology. Enzyme kinetics of AChE were evaluated in vitro to determine the effect of metal exposure on Km and Vmax. In silico molecular docking was used to assess the binding affinity of Cd and Pb with AChE. Combined Cd and Pb exposure significantly elevated MDA and reduced SOD and CAT activities, indicating oxidative stress. AChE activity was markedly reduced, with enzyme kinetics showing altered Km and Vmax, suggesting a mixed-type inhibition. Mitochondrial Complex I and IV activities were decreased, indicating compromised energy metabolism. Serotonin levels were significantly reduced, pointing to disrupted neurotransmission. Histopathological studies revealed neuronal damage and structural disorganization in the CA1 and CA3 regions. Molecular docking confirmed strong metal binding at the AChE active site, supporting the observed inhibition. Cd and Pb co-exposure leads to oxidative stress, enzyme inhibition, mitochondrial dysfunction, and neurotransmitter imbalance, collectively impairing hippocampal integrity. The in vitro and in silico evidence of AChE inhibition highlights its potential as a biomarker and therapeutic target in heavy metal-induced neurotoxicity.

B-4. Using the Rice Crop Manager tool to manage nutrients to improve fertilizer use efficiency

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Rice crop manager, a site-specific advice for nutrient management, weed control, and nursery management, it helps farmers improve rice yields, lower input costs, and higher net income. The need for fertilizer may vary across fields depending on crop and soil management techniques. To determine field-specific fertilizer N, P, and K rates, the Rice Crop Manager (RCM) web-based decision support tool was created. We compared RCM-calculated, field-specific nutrient management to a blanket fertilizer recommendation (BFR) and farmers' fertilizer practice (FFP). The RCM recommendation frequently increased the yields of crops. Fertilization based on RCM rather than BFR reduced the risk of financial loss. The effectiveness of an RCM recommendation relative to BFR and FFP can yield better results in growing mainly cereal crops. The nutrient management calculations used by RCM can be improved as new information and research findings become available. RCM can help guide the development of comparable nutrient management decision tools in growing areas.

B-5. Curcumin induces autophagy to alleviate oxidative stress and inflammation, promoting neuroprotection in senescent rats

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Curcumin (Curcuma longa) is a well-known medicinal plant recognized for its ability to induce autophagy across various model organisms, supporting cellular homeostasis. Its potential function as a caloric restriction mimetic (CRM) is being explored. This study explores curcumin's potential as a caloric restriction mimetic (CRM) in providing neuroprotection in a D-galactose (D-gal) induced accelerated aging rat model. Over six weeks, male rats were supplemented with D-gal (300 mg/kg b.w., subcutaneously) and curcumin (200 mg/kg b.w., orally). Oxidative stress in brain tissues was assessed through standard methodologies. Curcumin also interacts with PPARγ, inhibiting NF-κB and reducing inflammation. Additionally, reverse transcriptase polymerase chain reaction (RT-PCR) was employed to evaluate gene expression related to autophagy, neuroprotection, and aging. The results showed that curcumin significantly ($p \leq 0.05$) increased antioxidant levels and markedly reduced oxidative stress markers. Curcumin also upregulated aging-related genes like SIRT-1 and autophagy-related genes such as Beclin-1 and ULK-1, while promoting neuroprotection through increased NSE expression. These findings demonstrate that curcumin mitigates aging-induced oxidative damage via autophagy modulation and could serve as a neuroprotective agent against age-related disorders.

B-6. Identification of Japanese Encephalitis Virus RNA-Dependent RNA Polymerase Inhibitor using an Integrated Machine Learning and Structural Dynamics Approach

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Japanese Encephalitis Virus (JEV) remains a significant global health concern, particularly in Asia, due to the lack of specific antiviral therapies. The viral RNA-dependent RNA polymerase (RdRp), a key enzyme responsible for genome replication, represents a promising drug target. In this study, an integrated computational framework combining machine learning algorithms and structural dynamics was employed to identify potential RdRp inhibitors. Initially, large chemical libraries were screened using machine learning-based predictive models trained on known antiviral datasets to prioritize drug-like candidates. Top-ranked molecules were further subjected to molecular docking and molecular dynamics simulations to evaluate binding affinity, stability, and key interactions with the RdRp active site. Free energy calculations and conformational analyses provided insights into the structural determinants of inhibitor efficacy. The study identified several lead compounds with strong binding potential and favorable pharmacokinetic profiles, suggesting their suitability for further experimental validation. Overall, this integrative approach demonstrates the effectiveness of combining artificial intelligence and structural biology to accelerate the discovery of antiviral agents against JEV.

B-7. Nutritional and Biocultural Analysis of Pueraria tuberosa (Roxb. ex Wild.) DC.: A Wild and Lesser Utilized Edible for Dietary Diversification

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*Pueraria tuberosa (*Roxb. ex Wild.) DC. is a perennial tuber that holds great potential for regional food security due to its nutritional and ethno-medicinal importance, commonly found in South Asian countries. Although there is existing literature on its ethnomedicinal uses, there are no studies on its food applications, consumption patterns, or nutritional quality. Therefore, this study aimed to investigate the occurrence, distribution, nutritional benefits, and biocultural significance of *P. tuberosa*, as well as its potential for cultivation in family and nutri-gardens. Nutritional analysis was conducted using standard protocols, while biocultural knowledge was gathered through extensive fieldwork in Mirzapur District, Uttar Pradesh. Results show that *P. tuberosa* is rich in dietary fiber and contains high levels of essential macronutrients such as calcium (Ca), magnesium (Mg), and phosphorus (P), along with essential micronutrients like iron (Fe), manganese (Mn), selenium (Se), and zinc (Zn). The tuber also exhibits enormous antioxidant activity and contains flavonoids, vitamin C, and B1. Most uses identified in the study region were medicinal, followed by food, with common consumption methods including boiling, eating raw, or combining with other vegetables. The presence of anti-nutritional factors like tannins and oxalates suggests a need for crop breeding programs to enhance its nutritional value. Beyond its nutritional benefits, the species' resilient and hardy traits could be leveraged for large-scale cultivation, promoting dietary diversification.

B-8. Neuroprotective role of Dietary phenolic acid chlorogenic acid against arsenite-induced oxidative damage via modulation of Redox homeostasis and inflammation

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Arsenic is a well-known environmental toxin found in groundwater due to natural erosion and industrial processes. Chronic exposure to arsenic can cause severe cellular damage in various organs. Chlorogenic acid (CGA), a phenolic compound primarily found in coffee beans, is known for its antioxidant and anti-inflammatory properties. This study aimed to evaluate the neuroprotective potential of CGA against sodium arsenite (SA)-induced neurotoxicity in an albino Wistar rat model. The rats were randomly assigned to five different groups (n=5 per group): Group 1, the control group, received normal saline; Group 2 received CGA alone (300 mg/kg); Group 3 was exposed to sodium arsenite (10 mg/kg); Group 4 received both CGA (150 mg/kg) and sodium arsenite; and Group 5 received both CGA (300 mg/kg) and sodium arsenite. All treatments were administered orally for 28 days. Various behavioral, biochemical, and histological biomarkers were assessed to evaluate the neuroprotective effects of CGA. Exposure to sodium arsenite increased oxidative stress markers (malondialdehyde, nitric oxide) and pro-inflammatory cytokines (TNF-α, IL-6, IL-1β), while decreasing antioxidant enzymes (SOD, CAT, GST), reduced glutathione, AChE activity, total protein, and IL-10. Behavioral impairments, such as reduced rotarod and hanging test performance, and increased narrow beam time, were observed. Histopathological analysis confirmed these changes. CGA treatment significantly reversed these biochemical, behavioral, and histological alterations caused by SA. The findings of this study suggest that CGA has the potential to protect rat brain tissue from sodium arsenite-induced neurotoxicity, likely through its antioxidant and anti inflammatory effects.

B-9. Lipidomic Profiling of Polar to Neutral Lipid Transformation during Nutrient Starvation: Insights for Biofuel Synthesis via Fluorescence Spectroscopy and GC-MS

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Microalgae are highly promising for biofuel production from an ecological and environmental perspective, as they absorb carbon dioxide and can thrive on marginal lands using waste or saline water. Certain microalgal strains, such as Chlorella spp., are capable of accumulating significantly higher lipid levels under nutrient-deprived conditions, positioning them as a leading sustainable source of biofuels. The efficient production of high-grade biofuels from microalgal biomass depends on understanding the lipid content dynamics under various nutrient stresses. This study focuses on a detailed analysis of lipid composition alterations in Chlorella spp. under nitrogen and iron deprivation to provide novel insights into lipidomic changes during nutrient stress. The growth rate and lipid content of Chlorella spp. were assessed, with fluorescence microscopy following Nile red staining used to measure lipid accumulation. Lipid profiling was conducted using GC-MS, revealing a significant increase in triacylglycerol (TAG) production under nitrogen and iron-starved conditions. The observed changes in the fatty acid profile were attributed primarily to a reduction in polar lipids relative to TAGs. This research provides a comprehensive lipidomic analysis of Chlorella strains, demonstrating their potential for biodiesel production.

B-10. Microalgae: A Game-Changer in the Fight against Environmental Degradation

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Microalgae are emerging as a vital tool in the quest to mitigate environmental degradation. These microscopic organisms have amazing qualities that enable them to effectively address a range of ecological issues. Microalgae's remarkable capacity for photosynthetic activity allows them to filter water, generate oxygen, and absorb carbon dioxide. They have also been demonstrated to eliminate excess nutrients, heavy metals, and harmful contaminants from contaminated settings. This review emphasizes the diverse ways in which microalgae might be used to address environmental problems such land degradation, water pollution, and climate change. We can create sustainable solutions for trash management, bioenergy production, and environmental restoration by utilizing microalgae-based technology. As a sign of the enormous potential that microalgae offer, the expanding worldwide microalgae market was also examined, especially in regard to biotechnological applications.As the world grapples with the escalating consequences of environmental degradation, microalgae are poised to play a transformative role in shaping a more sustainable future.

B-11. Microbial Bioremediation Potential of Selected Bacterial Isolates Against Metsulfuron- methyl in Agricultural Soil

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Herbicides are in high demand right now in an effort to boost agricultural output. Commonly used to manage broadleaf weeds, cereals, and grasses, sulfonylurea herbicides like Metsulfuron-methyl (MM) can leave behind residues in agricultural soil and water that can cause ecological issues. A viable, affordable, and environmentally friendly method of cleaning MM-contaminated soil is microbial bioremediation. Two bacterial isolates (AS5 and AS3) from MM herbicide-contaminated soil in Prayagraj were identified in this study as *Achromobacter sp.* and *Pseudomonas sp.* based on morphological and biochemical analyses. The growth of the bacterial isolates was assessed at OD 660, and these isolates used the MM herbicide as their only carbon source. We also investigated a number of factors, including temperature, pH, MM concentration, and incubation duration, that influence the development of bacterial isolates. Both of the chosen isolates showed maximum growth at 100 ppm concentration following 4–6 days of incubation at pH 7 and 30°C. Additionally, we extracted the herbicide and used the TLC method to assess its degradation. The TLC verified that the MM herbicide had degraded. According to these results, the bacterial isolates may be helpful in bioremediation programs to clean up herbicide-contaminated environments.

B-12. Drought-Resilient Agriculture for Cognitive Nutrition and Mental Health in Ballia District

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The Ballia district in Uttar Pradesh, noted for its loamy soils, experiences frequent droughts that adversely affect agricultural productivity and nutritional security. The soil profiles in the district, especially in regions such as Sagarpali and Chitbadagaon, demonstrate differences in fertility and moisture retention, which affect crop yields during periods of water stress. The challenges are intensified by low organic matter levels and the widespread application of fertilizers such as DAP and Urea, which are associated with micronutrient deficiencies in soils. Drought-related declines in crop yields result in diminished availability of critical micronutrients, including iron, zinc, and magnesium. These deficiencies correlate with cognitive impairments and mental health challenges, notably heightened stress and anxiety in affected populations. Integrating sustainable agricultural practices is essential to mitigate these effects. Strategies including crop diversification, biofortification, and the implementation of drought-tolerant varieties can improve crop yield and nutritional quality. Biofortification is recognized as an effective strategy for mitigating micronutrient deficiencies through the enhancement of essential vitamins and minerals in staple crops. This presentation examines the relationship between sustainable agriculture, nutrition, and mental health in Ballia district, highlighting the necessity for integrated strategies to promote food security and cognitive well-being in drought-affected areas.

B-13. Neuroprotective Potential of Flavonoid against Cigarette Smoke Extract-Induced Neurodegeneration and Cognitive Decline in Zebrafish

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Neurodegeneration is marked by progressive neuronal loss and cognitive decline. Cigarette smoking remains a global health concern and is harmful to health. Cigarette smoke contains a complex of about 7,000 chemicals- 69 of which, including arsenic, chromium, nitrosamines, nicotine, and formaldehyde, are particularly harmful. The impact of cigarette smoking on human health, including cancer, cardiovascular diseases and COPD is already known. However, its effect on brain leading to neurotoxicity and accelerating the risk of neurodegenerative diseases, such as Alzheimer's disease remains less explored and unclear. The toxicants in cigarette smoke generate free radicals that trigger oxidative stress, inflammatory responses, and eventual neuronal loss, thereby promoting neurotoxicity. Herein, plant-derived flavonoids are of particular interest for their antioxidant and anti-inflammatory properties, which may offer neuroprotection against cigarette smoke-induced damage. The current study investigates the behavioral, biochemical, and histopathological alterations in adult zebrafish exposed to cigarette smoke extract (CSE). Zebrafish due to genetic homology with human genes serve as an excellent model in neurodegenerative research. In this study adult zebrafish were acclimatized under optimum conditions and divided into groups. Behavioral assessments were conducted on the final day of the experiment, biochemical analysis was performed to evaluate oxidative stress markers, while histological examinations of brain assessed structural integrity and alterations across various brain regions. The findings from the study highlight the neurotoxic effect of CSE on brain suggesting its potential risk in accelerating neurodegeneration and the neuroprotective role of flavonoids in combating neurodegenerative disorders and cognitive impairment.

B-14. Environmental models in the food chain: A review

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Diversity of food systems and their interaction with the environment has become a research topic for many years. Scientists use various models to explain environmental issues of food systems. This paper gives an overview of main streams in analyzing this topic. A literature review was performed by analyzing published scientific papers on environmental impacts in the food chain. The selection criteria were focused on different environmental approaches applied in the food chain and on the perspectives of future research. This review shows that on the one side there are generic environmental models developed by environmental scientists and as such applied on food. On the other side, there are models developed by food scientists in order to analyze food-environmental interactions. The environmental research in food industry can be categorized as product, process or system oriented. This study confirmed that the focus of product based approach is mainly performed through life-cycle assessments. The process based approach focuses on food processes such as heat transfer, cleaning and sanitation and various approaches in food waste management. Environmental systems in the food chain were the least investigated stream analyzing levels of environmental practices in place. Future research perspectives are the emerging challenges related to environmental impacts of novel food processing technologies, innovative food packaging and changes in diets and food consumption in connection with climate and environmental changes.

B-15. Soil organic carbon dynamics in relation to soil–food web–human health continuum

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Soil health is the main principle leading to human health, ensuring a healthy brain. It regulates the productivity, diversity, and stability of food chains and food webs. Soil is the primary reservoir for the flow of energy and nutrients from plants to consumers and recycled back by decomposers which are interlinked by food webs. The structure of these systems is closely related to soil organic carbon, nutrient availability, contamination (heavy metals, persistent organic pollutants, or pathogenic organisms) and various microbial activities. These attributes help in determining the nutritional value of plant-based foods and the feed quality for livestock helps in shaping the entire food chain from soil to human consumption. The soil–food web–human health continuum has emerged as an area of interdisciplinary research. Degraded soils due to erosion, salinization, contamination, and excessive chemical use alter nutrient cycling and biodiversity. Currently, anthropogenic activities including intensive agriculture, land use change, and pollution are depleting SOC stocks and altering soil health, food quality and contamination risks resulting in bioaccumulation and biomagnification within food chains. SOC also acts as a sink for pollutants influencing their transfer through trophic levels and potential bioaccumulation in humans. Understanding SOC dynamics within the soil–food web–human health continuum is therefore vital for ensuring food safety, nutritional security and resilience of ecosystem. This analysis synthesizes current knowledge on the interlinkages between soil properties, food chain, food web dynamics and human health outcomes. It also highlights sustainable soil management practices and policy interventions aimed at preserving soil integrity as a pathway to achieving global food and nutrition security.

B-16. Application of Nitrogenous fertilizers using SSNM tools in Rice and Wheat crop to improve the food security chain

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Nowadays, the application of nitrogenous fertilizer in cereal crops has increased to fulfil the human food requirement over the last six decades. Fertilizer is used in excess amounts beyond the crop needs, causing environmental pollution by emission of Greenhouse gas (GHG) from rice fields. Residual nitrogenous fertilizer combined with various water bodies also deteriorates human health. The pollution is alleviated by improving the N use efficiency by using different site-specific nutrient management (SSNM) tools like the leaf colour chart (LCC), chlorophyll meter, and rice crop manager (RCM) web-based tool. It enables the SSNM recommendations for rice and wheat crops to minimize the loss of fertilizer and improve the yields, profit, and use efficiency of fertilizers. It is necessary to use fertilizers sustainably without deteriorating the environment as well as human health.

B-17. Network Pharmacology and Molecular Docking Reveal the Therapeutic Mechanisms of Tripterygium wilfordii–Trichosanthes kirilowii Decoction in Diabetic Kidney Disease

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Diabetic kidney disease (DKD) is the leading cause of end-stage renal disease, and its complex pathology requires multi-target therapeutic approaches. Traditional medicines, Tripterygium wilfordii Hook.F. and Trichosanthes kirilowii Maxim, have demonstrated efficacy against DKD, yet their combined mechanism remains unclear. The active compounds of Leigongteng–Tianhuafen Decoction (LTD) were retrieved from the TCMSP database, while DKD-related targets were obtained from GeneCards, DisGeNET, and OMIM. Herb–compound–target and protein–protein interaction (PPI) networks were constructed to identify core targets. Functional enrichment was performed through GO and KEGG analyses. Key compound–target interactions were validated using molecular docking with AutoDock Vina and PyMOL. Additionally, a high-glucose-induced HK-2 cell model was employed for western blotting and immunofluorescence validation. Thirty-one active components and 196 LTD targets were identified, intersecting with 3,481 DKD-related targets. GO and KEGG enrichment revealed involvement in inflammatory responses, oxidative stress, insulin resistance, and AGE-RAGE, IL-17, and TNF signaling pathways. Docking studies highlighted strong binding affinities of kaempferol, triptolide, nobiletin, and schottenol with PTGS2 and RELA. Experimental validation showed that LTD treatment downregulated PTGS2, NF-κB, JNK, and AKT expression in HG-induced HK-2 cells. LTD exerts therapeutic effects in DKD by modulating inflammation, oxidative stress, and insulin resistance through regulation of PTGS2, NF-κB, JNK, and AKT. This integrative approach provides novel insights into the molecular mechanisms of LTD and highlights potential therapeutic targets for DKD management.

B-18. Survey of Algal Flora in Selected Habitats of Pratapgarh and Their Prospective Uses

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Algal diversity plays a pivotal role in maintaining soil fertility and sustaining agriculture productivity through their function in photosynthesis, biological nitrogen fixation, and nutrient cycling. The present study was undertaken to identify and evaluate the algal communities of rice fields in the Pratapgarh region, specifically at Kohandaur, Kandharpur and Shivpuri with emphasis on their relationship to the physicochemical characteristics of the soil. The study revealed a taxonomically diverse assemblage comprising members of Cyanophyta, Chlorophyta and Bacillariophyta. The recorded genera included Nostoc, Anabaena, Oscillatoria, Lyngbya, Calothrix, Scytonema, Chlorella, Spirogyra, Oedogonium and Cosmarium, Diatoms. Among these, Nostoc, Anabaena, Calothrix were found to be dominant nitrogen-fixing blue green algae that contribute significantly to soil fertility in rice ecosystem. Oscillatoria was identified as both a pollution indicator and a soil fertility enhancer, while Scytonema demonstrated potential for cosmetic and pharmaceutical application due to its antioxidant and photoprotective properties. Furthermore, Chlorella was recognized as a nutrient- rich species suitable for use as a biofertilizer, Spirogyra and Oedogonium indicated the presence of nutrient- enriched waters. Overall, these findings highlight the ecological and agriculture and significance of algal communities in rice fields, emphasizing their potential utilization as biofertilizers and soil stabilizers to improve crop productivity and environmental sustainability.

B-19. Artificial intelligence approaches to early identification and risk evaluation of non-communicable diseases (NCDs)

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Non-communicable diseases (NCDs) such as cardiovascular disorders, diabetes, cancer, and chronic respiratory illnesses contribute to the majority of worldwide morbidity and mortality, posing a substantial burden on healthcare systems. Conventional diagnostic methods and risk stratification techniques often lack the timeliness, personalization, and cost-efficiency necessary for effective disease prevention. Recently, artificial intelligence (AI) methodologies such as machine learning, deep learning, and natural language processing have emerged as transformative tools to improve early detection and risk evaluation of NCDs. AI-driven models harness and integrate vast, multimodal datasets—including electronic health records, medical imaging, genomic profiles, and lifestyle information—to uncover subtle patterns and accurately forecast disease onset. This review synthesizes the latest AI applications in managing NCDs, spotlighting advancements in predictive modeling, screening technologies, and clinical decision-support systems, alongside their potential to drive precision public health initiatives. Furthermore, it explores challenges related to data quality, algorithmic bias, interpretability, and ethical considerations that hinder large-scale clinical implementation. Finally, we emphasize the need for interdisciplinary collaborations, regulatory frameworks, and real-world validation to translate AI innovations into routine healthcare practice for reducing the global burden of NCDs.

B-20. Genome-Wide Association Studies in Cyanobacteria: Uncovering Traits and Functional Genomics in *Nostoc*

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Genome-Wide Association Studies (GWAS) have become essential tools in linking genetic variation to phenotypic traits, especially in complex, multifactorial biological systems. Although extensively utilized in plants, animals, and human health, their application in prokaryotes—particularly cyanobacteria—remains limited but highly promising. *Nostoc*, a filamentous, nitrogen-fixing genus of cyanobacteria, presents a compelling model for microbial GWAS due to its ecological importance, metabolic diversity, and genomic complexity. This review explores the emerging role of GWAS in cyanobacteria, with a specific focus on *Nostoc*, as a strategy for uncovering the genetic architecture of key traits such as heterocyst differentiation, environmental stress tolerance, secondary metabolite biosynthesis, and symbiotic interactions. We examine the current state of genomic resources available for *Nostoc*, discuss advances in computational tools tailored for microbial GWAS (e.g., pyseer, bugwas), and highlight experimental design considerations such as population structure, horizontal gene transfer, and phenotypic variability. Furthermore, the review underscores the potential of integrating GWAS with transcriptomics, metabolomics, and CRISPR-based validation to functionally characterize candidate genes. The adoption of GWAS in *Nostoc* could accelerate both fundamental understanding and applied research, enabling the development of biofertilizers, stress-resilient microbial strains, and new bioproducts. Ultimately, GWAS offers a promising pathway for advancing functional genomics in cyanobacteria, opening new frontiers in microbial ecology, biotechnology, and synthetic biology.

B-21. Decoding the subunit code of AMPK in Glioblastoma

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Glioblastoma (GBM) is the most aggressive form of adult brain tumor. It exhibits remarkable metabolic adaptability that supports rapid proliferation and therapy resistance. Among the key regulators of cellular energy balance, AMP-activated protein kinase (AMPK) plays a pivotal role; however, its subunit-specific functions in GBM remain poorly defined. AMPK exists as a heterotrimeric complex comprising catalytic α and regulatory β and γ subunits, whose distinct isoforms may differentially influence tumor behavior. We are investigating the expression landscape of AMPK subunits across glioblastoma. Our analyses reveal pronounced heterogeneity in AMPK subunit composition, with selective enrichment of γ- and β-subunits correlating with tumor grade and metabolic reprogramming signatures. Furthermore, differential subunit expression was associated with variable sensitivity to temozolomide, the standard chemotherapeutic agent for GBM. Our study suggests that AMPK functions through a subunit-defined regulatory network in glioblastoma rather than a uniform signaling axis. Decoding this "subunit code" can provide new insight into metabolic heterogeneity and open avenues for subunit-selective therapeutic targeting in glioblastoma.

B-22. Effect of the Menopause transition on Cognitive Performance in Midlife Women

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Menopause represents the end of menstruation. Menopausal transition or perimenopause begins at the ages between 45-55 years and the process lasts for several years. Menopause is a normal physiological event in the women's life. The average woman deals with menopause and its related symptoms for nearly one third of her life. Oestrogen plays an important role in woman's brain health. Reduced oestrogen levels effects neurological functions such as mood , memory and concentration impacting their cognitive and physical health during this phase of life. These cognitive difficulties are due to the heightened anxiety and sleep difficulties. The two main areas of the brain impacted by oestrogen are the hippocampus and the prefrontal cortex regions of the brain which are related to ability to learn and recall memories. Additionally, oestrogen also helps support brain elasticity and Pushes neurons to work harder. Limited research studies are available focussing on the relationship between the menopausal symptoms and cognitive performance in Indian women. This paper contains data collected from 200 women who are in the age range of 45 to 60 years and experiencing menopausal transition. The prevalence of menopausal symptoms was studies by using the standardized Menopause Rating Scale (MRS) developed by Lothar A.J. Heinemann et al., (1990). The cognitive performance was assessed by using subjective cognitive decline questionnaire developed by Rami et al.,(2014). A cross sectional comparative design was adopted for the study. Data was taken from the women living in rural and urban areas of Guntur and Kurnool districts of Andhra Pradesh state. The study concludes that majority of urban women experienced somatic and psychological symptoms whereas rural women scored high on urogenital symptoms attributing to the socio-economic , health and lifestyle factors. Comparatively urban females scored less cognitive decline scores than rural counterparts. However, a positive and significant association was found between the prevalence of menopausal symptoms and cognitive performance of women. The study recommends the need for awareness and educational interventions to women about the severity of menopausal symptoms and how these symptoms will decrease their quality of life. The findings provide a novel guidance for AI based interventions designed to preserve cognitive health in women undergoing the menopause transition such as validated machine learning model for identifying women experiencing severe subjective cognitive decline, along with associated factors

B-23. Integrating Water footprint assessment ((WFA) Hydrological approach in down stream river terrain

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Integrating water footprint Assessment (WFA) is a tool to estimate water consumption by humans and the available fresh water. WFA focused on how anthropogenic activity impacted in the quantity and quality of sediments deposition and pattern in river terrain and geochemical environment. The hydrological characteristics of sampled water were examined for two years fluctuation in 2022–2024 in the down stream river way of Ganga at south eastern Prayagraj city. The ionic speciation and minerals dissolution/ precipitation were calculated. River water circulation at high depths are moderate to high mineralized waters of Na-HCH_3. In contrast to the shallow environment, the CO_2-rich, deeper water of the Ca-HCO_3-SO_4 type and undergoes significant changes in the baseline chemistry along flow lines. The heavy metals concentration ranged between 18.61-29.14, 03.14 - 09.91, 51.25 -78.08, 34.29 -23.49, 0.18- 0.72, 21.26- 22.60 and 10.72- 13.44 mg/kg for Co, Cu, Cr, Cd, Ni, Zn and Pb, respectively. Geo-accumulation index was noted between (0 and 2, class 2) which showed that sediment was contaminated to moderately contaminated and may have adverse affects on freshwater ecology of the river specially post flow. There were analyzed green-to-blue water footprintratio i.e. 0.7-010. Mathematical equation were also derived the hydro geological variables for better understanding of the study area, hence proper management strategies are required to control the direct discharging of wastewater in the river flow in way of zero-discharge and ecological integration for healthy life.

B-24. Study on relevance of Ayurveda in modern occupational health

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Occupational health focuses on the prevention and management of work-related diseases and the promotion of overall well-being in the workplace. Ayurveda, the ancient Indian system of medicine, offers a holistic approach to occupational health by emphasizing balance between body, mind, and environment. Ayurvedic principles such as *Dinacharya* (daily routine), *Ritucharya* (seasonal routine), proper diet, stress management, and herbal remedies can play a significant role in preventing lifestyle disorders, fatigue, and mental stress commonly seen in various professions. Ayurvedic therapies like *Abhyanga* (oil massage), *Nasya* (nasal therapy), and *Rasayana* (rejuvenation therapy) help maintain physical strength, mental clarity, and immunity. This paper explores the relevance of Ayurveda in modern occupational health, highlighting its potential to enhance workplace wellness, reduce stress, and improve quality of life for workers across different fields.

B-25. Importance of Indian Medicinal Plants to Cure Occupational Diseases

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Occupational diseases, arising from prolonged exposure to physical, chemical, and biological hazards in the workplace, remain a major challenge to public health and productivity. Conventional treatments often provide symptomatic relief but may lead to side effects or limited long-term efficacy. Indian medicinal plants, enriched with diverse phytochemicals, have been traditionally used in Ayurveda, Siddha, and Unani systems of medicine to address a wide range of ailments, including those linked to occupational exposures. Plants such as *Withania somnifera* (Ashwagandha), *Curcuma longa* (Turmeric), *Ocimum sanctum* (Tulsi), *Azadirachta indica* (Neem), and *Aegle marmelos* (Bael) possess anti-inflammatory, antioxidant, hepatoprotective, cardioprotective, and adaptogenic properties that make them valuable in the prevention and management of respiratory disorders, skin diseases, musculoskeletal problems, and metabolic syndromes commonly observed among workers. Scientific validation through phytochemical screening, pharmacological studies, and clinical trials further supports their therapeutic potential. The integration of Indian medicinal plants into occupational healthcare strategies can offer safe, cost-effective, and sustainable solutions to reduce disease burden and improve the quality of life of workers.

B-26. Phytosterols from *Asparagus racemosus* and *Dioscorea bulbifera* as Potential Antioxidant, Antibacterial, and Antibiofilm Agents

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Phytosterols, such as β-sitosterol and stigmasterol are widely recognized for their therapeutic potential, yet systematic evaluation of their extraction and multifunctional bioactivities from medicinal plants remains limited. The present study investigated phytosterol profiles and bioactivities of *Asparagus racemosus* and *Dioscorea bulbifera*. Phytosterols were extracted using solvents of varying polarity and characterized by HPLC and ^{1}H NMR spectroscopy, which confirmed the presence of β-sitosterol (RT ~3.3 min) and stigmasterol (RT ~3.2 min). Quantitative analysis revealed β-sitosterol as the major constituent in *A. racemosus*, with chloroform extracts yielding the highest concentration (0.2790 mg/g), while both β-sitosterol (0.3968 mg/g) and stigmasterol (0.0228 mg/g) were present in the ethyl acetate extract of *D. bulbifera*. Antioxidant assays (DPPH and FRAP) demonstrated that the ethyl acetate extract of *D. bulbifera* exhibited the strongest radical scavenging (80.53%) and reducing power, while its hexane extract also showed high activity (78%). Antibacterial evaluation using MIC and agar well diffusion assays indicated potent activity of the ethyl acetate extract of *A. racemosus* against *Klebsiella pneumoniae* and MRSA (MIC 0.25 mg/mL), hexane extract against *Bacillus cereus* (MIC 0.125 mg/mL), and *D. bulbifera* ethyl acetate extract against MRSA and *Pseudomonas aeruginosa* (MIC 0.125 mg/mL). Significant anti-biofilm activity was observed against all tested pathogens, with ES and HD extracts being most effective in reducing biofilm formation, EPS production, and bacterial surface hydrophobicity. In conclusion, phytosterol-rich extracts of *A. racemosus* and *D. bulbifera* exhibit strong antioxidant, antibacterial, and anti-biofilm activities, underscoring their potential as natural therapeutic agents.

B-27. Formulation of Garlic Oil-Loaded Solid Lipid Nanoparticles for Enhanced Therapeutic Activity

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Garlic oil (GO), rich in bioactive organosulfur compounds such as Allyl sulphide (AS), Diallyl disulphide (DADS), and Diallyl trisulphide (DATS), possesses notable antimicrobial and anticancer potential. Its clinical utility, however, is constrained by inherent hydrophobicity and chemical instability. In this study, we successfully encapsulated GO into lipid nanoparticles using the emulsification-solvent diffusion technique coupled with low-temperature solidification, providing enhanced stability and delivery. Physicochemical characterization of the garlic oil-loaded solid lipid nanoparticles (GO-SLN) revealed uniform spherical morphology with mean particle size of 120 nm and encapsulation efficiency of approximately 82.15±3.67%. Structural confirmation and GO retention were validated through UV-Vis spectroscopy, nuclear magnetic resonance (NMR), and Fourier-transform infrared spectroscopy (FTIR). Colloidal stability was confirmed via zeta potential analysis, while morphological assessment was conducted using transmission electron microscopy (TEM). The nanoencapsulated GO exhibited superior antibacterial efficacy against multidrug-resistant (MDR) bacterial strains, showing markedly lower minimum inhibitory concentrations (MIC) than its non-encapsulated counterpart. Furthermore, in vitro assessment via the sulforhodamine B (SRB) assay demonstrated. In vitro anticancer studies using the SRB assay revealed dose-dependent cytotoxicity against MCF-7 breast cancer cell lines, with GO-SLNs inducing a significant apoptotic response. This study underscores the significant role of lipid-based nanocarriers in augmenting the stability, bioavailability, and therapeutic performance of GO, positioning it as a promising strategy to combat MDR infections and hormone-responsive breast cancer. Consequently, lipid nanoparticulate systems emerge as a highly effective delivery platform to overcome prevailing challenges in treating antibiotic-resistant infections and oncology.

B-28. Fabrication of Terpineol-Loaded Solid Lipid Nanoparticles and Their Antimicrobial Efficacy Against Pathogenic Microbes

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Garlic oil (GO), rich in bioactive organosulfur compounds such as Allyl sulphide (AS), Diallyl disulphide (DADS), and Diallyl trisulphide (DATS), possesses notable antimicrobial and anticancer potential. Its clinical utility, however, is constrained by inherent hydrophobicity and chemical instability. In this study, we successfully encapsulated GO into lipid nanoparticles using the emulsification-solvent diffusion technique coupled with low-temperature solidification, providing enhanced stability and delivery. Physicochemical characterization of the garlic oil-loaded solid lipid nanoparticles (GO-SLN) revealed uniform spherical morphology with mean particle size of 120 nm and encapsulation efficiency of approximately 82.15±3.67%. Structural confirmation and GO retention were validated through UV-Vis spectroscopy, nuclear magnetic resonance (NMR), and Fourier-transform infrared spectroscopy (FTIR). Colloidal stability was confirmed via zeta potential analysis, while morphological assessment was conducted using transmission electron microscopy (TEM). The nanoencapsulated GO exhibited superior antibacterial efficacy against multidrug-resistant (MDR) bacterial strains, showing markedly lower minimum inhibitory concentrations (MIC) than its non-encapsulated counterpart. Furthermore, in vitro assessment via the sulforhodamine B (SRB) assay demonstrated. In vitro anticancer studies using the SRB assay revealed dose-dependent cytotoxicity against MCF-7 breast cancer cell lines, with GO-SLNs inducing a significant apoptotic response. This study underscores the significant role of lipid-based nanocarriers in augmenting the stability, bioavailability, and therapeutic performance of GO, positioning it as a promising strategy to combat MDR infections and hormone-responsive breast cancer. Consequently, lipid nanoparticulate systems emerge as a highly effective delivery platform to overcome prevailing challenges in treating antibiotic-resistant infections and oncology.

B-29. Neuroprotective potential of Natrum sulphuricum and Natrum phosphoricum in alcohol- and acetaminophen-induced brain damage via modulation of the unfolded protein response

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Synergistic potentiation of alcoholic liver damage and acetaminophen toxicity involves protein misfolding, UPR activation, and cirrhosis-related brain pathology. In addition to liver injury, these pathologies also result in neuroinflammation, neuronal dysfunction, and cognitive dysfunction. The present study explored therapeutic action of biochemic tissue salts *Natrum sulphuricum* (NS) and *Natrum phosphoricum* (NP) with specific reference to their neuroprotective activity. FTIR and UV-Vis spectroscopy established the existence of sodium sulfate and sodium phosphate nanoparticles in NS and NP, respectively. Rat cirrhosis was established by treatment with chronic ethanol (4.5%) and acetaminophen (300 mg/kg) for seven days, followed by treatment with NS or NP (50 mg/kg) through drinking water for four weeks. Behavioral testing showed severe locomotor and cognitive impairment in cirrhotic animals which were greatly improved by treatment with NS and NP, suggesting normalization of brain function. Molecular analysis by RT-PCR, western blotting, and immunohistochemistry showed normalization of gene and protein expression of UPR-related genes and proteins, alleviation of ER stress, and diminution of downstream neuronal damage. Together, these results present the first experimental evidence that NS and NP not only protect against alcohol- and acetaminophen-induced liver damage but reverse the brain from cirrhosis-related neurocognitive impairment. This research unmasks the therapeutic value of NS and NP as a form of adjuvant therapy that relieves hepatic and neurological complaints of chronic liver disease.

B-30. Plant disease resistance genes: Current insights & future perspectives

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The escalating global population & the degree of disease outbreak has led to an increased demand for both quantity & quality of products. Throughout history, plant disease outbreaks have posed significant risks to global food security, agricultural output & environmental sustainability compromising with the substantial loss of primary productivity & biodiversity, that negatively influence the yield & quality of plants. Therefore, plant disease management has became one of the major objectives now-a-days. No adaptive immune system equivalent to highly effective vertebrate immune system has been detected in plants. However, plants have not been passive in the face of these assaults, but have developed competent & efficacious defence mechanisms to prevent damage owing to pathogen infection. Farmer's reliance on monoculture of susceptible varieties & repeated chemical sprays enhances vulnerability of agro ecosystem & raises environmental & food safety concerns out of which, host disease resistance genes emerge as a thriving & sustainable approach to protect plant against various pathogens. Resistance genes (R-genes) convey defensive activities against pathogen attack by encoding R-proteins. Significant advances has been made in understanding pathogenesis related genes, systemic defence responses & pathogen associated molecular pattern triggering immunity in disease resistance. Furthermore, links have been established between plant-pathogen interaction , different modes of resistance & susceptibility. These breakthroughs continuously results in novel approaches to reshaping & engineering plant resistance. Molecular analysis of disease in plants entering a new era, deemed by new technologies & multidisciplinary interactions highlighting sustainable alternatives. Research in this field not only addresses immediate threats but also contributes to long-term sustainability by boosting biodiversity & ecological balance.

B-31. Formulation and Bioanalytical Evaluation of Xanthohumol-Loaded Butyrosomes Utilizing a Novel Indigenous Lipid from Diploknema butyracea (Roxb.) H.J. Lam

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Xanthohumol (XH), a prenylated chalcone derived from Humulus lupulus L. (hop), possesses significant therapeutic effects. However, its clinical application is limited due to poor bioavailability. Lipids are widely used as nanocarriers for drug delivery, but selecting an appropriate lipid remains a major challenge. Diploknema butyracea (Roxb.) H. J. Lam a sub-Himalayan tree of India and Nepal yields Cheura lipid. This is the first study to employ Cheura lipid in the development of SLNs (butyrosomes) for the encapsulation of XH. XH-butyrosomes formulated using Cheura lipid was evaluated for particle size and PDI. TEM was used to examine the morphology and distribution of the nanoparticles. A bioanalytical HPLC method was validated according to ICH M10 guidelines for pharmacokinetic analysis. Male Sprague Dawley rats were administered XH-butyrosomes and XHsuspension (30 mg/kg, p.o.), and plasma samples were analyzed for pharmacokinetic profiling. The %EE, %DL, and in-vitro drug release profiles were evaluated to determine the XH-butyrosomes release behaviour. The optimized XH-butyrosomes showed a particle size (328.3 nm), PDI (< 0.5), a zeta potential (– 9.7 ± 0.8 mV), %EE (53%), and % DL (10.25%). TEM confirmed a spherical morphology with uniform distribution. The drug release from XH-butyrosomes reached 98.90% over 24 hours, compared to 88.70% observed with XH-suspension. The validated HPLC method showed high specificity, and linearity for plasma quantification. Pharmacokinetic analysis of XH-butyrosomes revealed Tmax at 12 h, higher Cmax, and significantly increased AUC compared to XH-suspension. XH-butyrosomes demonstrated enhanced oral bioavailability highlighting Cheura lipid potential as an efficient nanocarrier system.

B-32. Hesperidin Attenuates Acrylamide-Induced Testicular Dysfunction in Rats: Insights from Molecular Docking, Biochemical, and Histopathological Evaluations

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Acrylamide (AA), a carcinogenic compound formed during high-temperature cooking of starchy foods, poses significant health risks, including reproductive dysfunction and infertility in male rat. Plant-derived flavonoids, recognized for their pharmacological potential, offer promising therapeutic options. Hesperidin (HES), a strong antioxidant, has been studied for its protective effects against AA-induced oxidative stress and reproductive damage. The present study aimed to evaluate the effectiveness of HES in mitigating AA-induced testicular dysfunction in male albino rats. The study comprised two experimental sets. In the first set, molecular docking analyses were performed to evaluate the binding affinity of HES and AA with key target molecules. A protein-protein interaction (PPI) network of combined AA and HES targets included 122 nodes and 1210 edges, with hub genes primarily associated with apoptosis regulation, DNA fragmentation, protein binding, and ubiquitin ligase activity. HES demonstrated superior binding affinity to core targets compared to AA, suggesting its potential protective role. In the second set, 24 male albino rats were randomly assigned to four groups (n=6 per group). Group I served as control; Group II received AA (10 mg/kg, orally, 5 days/week for 60 days); Group III received HES (40 mg/kg, orally, 2 days/week for 60 days); and Group IV received AA as in group II and HES treatment as group III. AA exposure resulted in significant oxidative stress, as evidenced by elevated lipid peroxidation (LPO) and impaired antioxidant defences, along with reduced sperm viability, motility, altered levels of serum testosterone, FSH, and LH, increased DNA damage, and heightened inflammatory and apoptotic markers. HES supplementation significantly reversed these detrimental effects, restoring antioxidant capacity, reproductive hormone balance, and sperm parameters. Light and electron microscopy corroborated these findings by showing reduced testicular degeneration and improved cellular integrity in HES-treated rats. In conclusion, HES exhibits remarkable protective effects against AA-induced testicular toxicity through its antioxidant, anti-inflammatory, and anti-apoptotic mechanisms. These findings support the potential of HES as a natural therapeutic agent for mitigating reproductive health impairments caused by environmental toxicants.

B-33. Decoding Soil Fauna Response to Polyurethane Microplastics with Earthworms as Bioindicator

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Microplastics represent an escalating threat to both marine and terrestrial ecosystems. Rapid plastic production, fueled by population growth and poor waste management has led to significant soil accumulation, posing risks to both human health and soil mesofauna. These minute, diverse, and pervasive pollutants typically less than 0.5mm in size demand urgent investigation and mitigation to safeguard environmental health. Microplastic adversely affect soil fauna by disrupting feeding habits, reproduction, and metabolic processes. Among them, polyurethane (PU) microplastics, widely used in foams, coatings, and adhesives, pose potential risks to soil health. However, their impact on soil biota remains poorly understood. This study investigated the ecotoxicological effects of polyurethane microplastics on African nightcrawler Eudrilus eugeniae, a model earthworm species widely used in soil health assessment and vermicomposting due to its high reproduction rate and efficiency in breaking down organic matter. E. eugeniae were exposed to increasing concentration of polyurethane (0, 200, 400, 600, and 800mg/kg soil) over a 56-days. Results showed a concentration-dependent reduction in body weight without significant mortality. Ingestion was identified as the primary exposure route for the microplastics in earthworm. Histopathological examination of gastrointestinal tract mainly gut was analyzed along with biochemicals assays like catalase (CAT), lipid peroxidation (LPO), superoxide dismutase (SOD) and reduced glutathione (GSH) were conducted to assess oxidative stress. Also, acetylcholinesterase (AChE) activity was measured as a neurotoxicity biomarker. The findings suggest Eudrilus eugeniae readily consumes microplastics, failing to distinguish them from soil particles, making it a suitable bioindicator for soil microplastic exposure.

B-34. Effects of Cadmium- Contaminated Soil on Morphological, Physiological, and ROS Responses in Tomato Plants

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Tomato plants (*lycopercicun esculentum*) at 0, 18, 36, and 54 days after sowing (DAS) are studied to determine the effects of different Cd concentrations (0.05, 0.075, and 0.1 mg/kg soil) on their morphological and physiological characteristics. In addition to physiological parameters like LAI, RGR, total chlorophyll content, the photosynthesis process. rate, stomatal conductance, and transpiration, morphological parameters like plant height, shoot length, root length, number of leaves, number of branches, number of fruits, and biomass were also examined. So as to comprehend the oxidative stress triggered by Cd, the buildup ROS and the activity of antioxidant enzymes (catalase, per antioxidant, and superoxide dismutase) were also evaluated. Cd bioaccumulation factors (BAFs) were also measured in the study to assess the degree of Cd uptake. The findings showed that plant growth and physiological function were dose-dependently inhibited, with biomass, chlorophyll content, and photosynthetic activity significantly decreasing with increasing Cd concentration. The plant's reaction to oxidative stress caused by Cd was highlighted by increased ROS levels and antioxidant enzyme activity. The results highlight the harmful impacts of Cd pollution on tomato plants and provide significant insight into the processes underlying heavy metal stress and bioaccumulation.

B-35. Hanuman Langurs Life Threats and Conflicts: Man-Monkey Interactions and Conservation Challenges

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Human population growth and associated activities such as deforestation, agriculture, and urbanization are increasingly encroaching upon wildlife habitats. This ongoing habitat fragmentation forces species that cannot adapt to altered environments into smaller, marginal patches. In our study of Hanuman langurs (*Semnopithecus entellus*), we systematically recorded various aspects of human-langur interactions. Each interaction was assessed based on the initiator (human or langur), the age class and sex of both humans and langurs involved, the surrounding human density, the minimum distance between the interacting parties, the nature of the interaction, the presence of food, and the manner in which food was acquired by the langurs (if at all). Additionally, we documented whether the langurs exhibited aggressive behavior and how human visitors responded. Our findings revealed that the majority of interactions were food-related. Aggressive behavior by langurs, such as threatening or chasing visitors. Interestingly, discrepancies were noted between the visitors' accounts obtained through interviews and the direct observations made during the study. Study aimed to identify the major threats affecting the survival and longevity of Hanuman langurs (*Semnopithecus entellus*). Data were gathered through surveys in which respondents reported various causes of langur mortality observed in the region. The results indicated that both anthropogenic and environmental factors play a significant role in langur deaths.

B-36. A Study on Smartphone Addiction and Personality Traits Among Young Adults

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Smartphones have become an indispensable part of modern life, especially among young adults who rely on them for communication, entertainment, education, and social connectivity. While smartphones offer numerous benefits, their excessive and uncontrolled use has given rise to the phenomenon of smartphone addiction which encompasses an excessive amount of smartphone use that interfered with a person's everyday life and relationships (Sharon Levy, 2021). Personality traits, as conceptualized by the Big Five model proposed by Goldberg (1992), offer a meaningful framework for understanding individual differences in susceptibility to addictive behaviors. Traits such as conscientiousness, neuroticism, agreeableness, openness, and extraversion have been linked to various patterns of technology use and self-regulation. The study aimed to assess the levels of smartphone addiction and its relationship with personality traits among young adults in the age group of 18-24 years. The sample consisted of 80 young adults (40 males and 40 females). Smartphone Addiction Scale developed by Dr. Vijashri and Dr. Masaud Ansari (2020) and Big Five Personality Scale developed by Goldberg (1992) were used to assess the smartphone addiction levels and personality traits respectively. Ex-post facto research design was adopted and purposive random sampling method was used for the selection of the respondents. The results of the study indicated that majority (55%) of the respondents had moderate levels of smartphone addiction, while 35 per cent had high levels and a meagre per cent (10%) had low levels of smartphone addiction. Smartphone addiction was negatively related with conscientiousness and agreeableness, and positively related with neuroticism and openness, while extraversion showed no significant relationship. The study suggests that young adults with high neuroticism and low conscientiousness are more prone to smartphone addiction and personality-based interventions focusing on emotional regulation and self-control may help in reducing smartphone addiction among young adults.

B- 37. Luteolin Protects Against Tin Oxide Nanoparticle-Induced Hepatic Injury by Modulating ROS and NF-κB Signaling

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The rapid expansion of nanotechnology has created new opportunities in industry and medicine, yet concerns about nanoparticle safety remain unresolved. Tin oxide nanoparticles (SnO_2 NPs), commonly used in electronics and biomedical devices, can interact with biological systems, trigger toxic effects and also responsible for the pale and discoloration of the liver which induce hepatic injury. The liver, as the central organ for metabolism and detoxification, is especially vulnerable. SnO_2 NPs promote excessive reactive oxygen species (ROS) generation, which disrupts antioxidant defenses and activates inflammatory pathways, particularly NF-κB signaling. This cascade leads to hepatocellular damage, altered function, and structural injury. Luteolin, a dietary flavonoid found in vegetables, fruits, and medicinal plants, has attracted attention for its antioxidant and anti-inflammatory activities. It scavenges ROS, stabilizes cellular redox balance, and prevents NF-κB activation, thereby reducing cytokine release and inflammation. These properties suggest its potential as a natural hepatoprotective compound. In this study, male Wistar rats were assigned to four groups: control, luteolin, SnO_2 NPs, and luteolin + SnO_2 NPs. Assessments included body weight, liver morphology, liver function tests, blood smear analysis, and histology with hematoxylin and eosin staining. SnO_2 exposure caused liver abnormalities, reduced body weight, elevated serum enzymes, and histological changes such as degeneration and vacuolation. Remarkably, luteolin co-treatment alleviated these alterations, restoring liver appearance, improving biochemical markers, and preserving hepatic structure. In conclusion, luteolin demonstrated significant protection against SnO_2 NP-induced hepatic injury by limiting ROS production and suppressing NF-κB–mediated inflammation. These results highlight luteolin as a promising natural therapeutic agent against nanoparticle-related hepatotoxicity

B- 38. Exploring Morin Hydrate's Role in Combating Isoniazid-Induced Oxidative Stress and Inflammation in Liver and Kidney

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Tuberculosis is effectively treated with a combination of drugs such as isoniazid (INH), rifampicin, pyrazinamide, and ethambutol. However, prolonged use of these drugs is associated with severe liver and kidney damage. A recent study investigated the protective role of morin hydrate (MH), a plant-derived flavonoid, against INH-induced hepato-renal toxicity in rats. In this study, rats were treated with INH for 4 weeks, followed by oral administration of MH (50 mg/kg), while silymarin (50 mg/kg) served as the positive control. Liver and kidney injury was assessed through elevated levels of aspartate transaminase, alanine transaminase, alkaline phosphatase, lactate dehydrogenase, gamma-glutamyl transferase, bilirubin, triglycerides, total cholesterol, urea, uric acid, and creatinine, along with reduced levels of total protein and albumin. INH also induced oxidative stress, reflected by increased lipid peroxidation (malondialdehyde) and decreased antioxidant enzyme activities, including superoxide dismutase, catalase, and reduced glutathione (GSH), in hepatic and renal tissues. Additionally, INH elevated serum inflammatory markers [TNF-α, IFN-γ, and IL-6] while decreasing IL-10. Co-treatment with MH significantly attenuated hepato-renal injury, as evidenced by a dose-dependent restoration of serum biomarkers toward normal levels. Histopathological examinations of liver and kidney tissues further supported these biochemical findings. Collectively, the results demonstrate that oral supplementation with MH offers significant protection against INH-induced hepatic and renal damage.

B-39. Histopathology, Immunohistochemistry, and Molecular Biology in Eviscerated And Enucleated Specimens of End-Stage Uvietic Diseases

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Purpose: To assess the histopathological, immunohistochemical, and molecular biology in 30 eyes with end-stage intraocular inflammation that needed enucleation or evisceration.

Methods: A retrospective study was conducted on 30 enucleated/eviscerated eyes. Detailed histopathological examination, immunohistochemistry (IHC), and polymerase chain reaction (PCR) analysis on paraffin-embedded tissue were performed.

Results: Sympathetic ophthalmia (n=9) demonstrated diffuse granulomatous inflammation of the uveal tract with predominant CD3+ T-cell infiltration. Vogt-Koyanagi-Harada disease (n=1) showed non-granulomatous inflammation with both CD3+ and CD20+ cells. The tuberculous uveitis group (n=9) comprised panuveitis (5), anterior uveitis (2), scleritis (1), and sclerouveitis (1), all exhibiting granulomatous inflammation with caseation; MTB DNA was PCR-positive in several, and acid-fast bacilli were identified in three specimens. Eales disease (n=3) revealed non-granulomatous inflammation, with PCR for MTB positive in two cases. Other findings included pars planitis (n=1) with CD3+ and CD68+ positivity; acute retinal necrosis (n=1) showing vascular occlusion, herpes viral inclusions and PCR positive for herpes; nocardiosis (n=1) with necrotizing granulomatous inflammation and subretinal abscess; post-dengue endophthalmitis (n=1) with suppurative necrosis and *Bacillus cereus* isolation; and neovascular glaucoma with underlying uveitis (n=1).

Conclusion: Despite advances in immunosuppressive and biologic therapies for uveitis, certain cases continue to progress to end-stage, vision-threatening disease requiring surgical removal of the eye. Histopathology, supported by IHC and PCR, remains essential in confirming the diagnosis and understanding disease mechanisms in these refractory cases.

B-40. Review on Drug-Resistant Bacteria: Current Treatment Strategies & Future Perspectives

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Superbugs, which are a collection of bacteria, have acquired resistance to many antibiotics, presenting a substantial danger to the lives of individuals who are seriously ill or receiving medical care in a hospital setting. This article presents current treatment options used against prevalent antibiotic-resistant bacteria, such as *Enterobacteriaceae*, resistant to vancomycin antibiotics, Enterobacteriaceae, resistant to carbapenem antibiotics, and methicillin-resistant *Staphylococcus aureus*. *Enterococcus* and *Pseudomonas aeruginosa* are resistant to multiple drugs, and Escherichia coli are resistant to multiple drugs. Pathogen-directed treatments reduce bacterial toxicity by modifying their virulence factors through targeted mechanisms. Conversely, host-directed treatments restrict the growth of these superbugs by manipulating immune cells, improving the functioning of host cells, and altering the progression of the disease. Numerous innovative medicines that specifically target the most prevalent superbugs globally are either being launched to the market or are presently undergoing clinical development. The utilization of medicinal plants containing potent secondary metabolites can yield substantial efficacy in the fight against these highly resistant bacteria. The field of nanotechnology has emerged as a promising answer for effectively tackling these pressing concerns. In light of the potential development of resistance to novel antibiotics in the future, it is imperative to consistently devise optimal treatment strategies for these superbugs. It is imperative for patients to stick to reasonable antibiotic usage and uphold proper hygiene practices.

B-41. In Silico Screening of Phyto Compounds Targeting NS1 Protein Of Dengue Virus

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Dengue fever, caused by the Dengue virus (DENV), remains a significant global health challenge without a specific antiviral therapy. The viral non-structural protein 1 (NS1) plays a critical role in viral replication, morphogenesis, and pathogenesis, making it an attractive target for the development of novel therapeutic agents. This study aimed to identify potential inhibitors of the DENV NS1 protein from natural sources using a computational approach. An in silico screening of 25 known antiviral phytochemicals was performed to evaluate their potential to bind to and inhibit the NS1 protein. The three-dimensional crystal structure of the DENV NS1 protein (PDB ID: 4OIG) was used as the target for molecular docking simulations with the selected phytochemicals. The binding affinities, interaction patterns, and hydrogen bond formations were analyzed to determine the most promising candidates. Additionally, the pharmacokinetic profiles of the compounds were assessed through ADMET (Absorption, Distribution, Metabolism, Excretion, and Toxicity) analysis to evaluate their drug-likeness. The molecular docking results revealed that several phytochemicals exhibited strong binding energies and stable interactions with the active site of the NS1 protein. Among the screened compounds, Swertiapuniside demonstrated the highest binding affinity with a docking score of -10.0 kcal/mol, forming multiple hydrogen bonds. Other compounds, including Diosgenin (-8.8 kcal/mol) and Quercetin (-8.2 kcal/mol), also showed significant inhibitory potential. The ADMET analysis of top candidates indicated favorable oral bioavailability and safety profiles, suggesting their suitability for further development. In conclusion, this computational study successfully identified several plant-derived compounds with strong potential to inhibit the DENV NS1 protein. These findings provide a basis for further in vitro and in vivo experimental validation to develop effective, naturally-sourced antiviral drugs against Dengue fever.

B-42. Investigation of antioxidant enzymes and neuro-biomarker with metabolomics in earthworm induced by microplastic pollution in soil ecosystem

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Plastic particles less than 5mm in size, delineated as microplastics, are increasingly recognized as widespread environmental pollutants with potential impacts on living existence. Polyethylene (PE) is broad category of microplastic which are much available in personal care products, industrial abrasives, medical applications and others. PE is known to be a considerable toxicant in various study, but least available for invertebrate systems like earthworms. The existing data regarding the effects of polyethylene (PE) microplastics (MPs) on earthworms are insufficient to fully comprehend their toxicity. In this study, earthworms *Eudrilus eugeniae* were exposed to artificially soil added PE at a concentration ranging from 0.05 to 1.0 % for 56 days to determine the concentration range causing negative effects on earthworms and to uncover the potential toxic mechanisms. The individual growth, reproduction, behaviour, lipid peroxidation (LPO) antioxidant enzyme activities such as superoxide dismutase (SOD), catalase (CAT), and glutathione sulfotransferase (GST), neurotoxic indicator Acetyl choline esterase (AChE) and metabolomics were measured. The observed differences in responses of several cross-scale endpoints suggested that metabolomics or antioxidant enzymes are more susceptible to PE-MPs than individual indices. Significant changes in metabolites, SOD, CAT, and GST, as well as important metabolites identified based on metabolomics, demonstrated that PE-MPs at concentration similar to or above 0.05 g/kg possessed a toxic effect on earthworms, despite the lack of significant changes in growth inhibition based on body weight. It is assumed that the toxicity of PE-MPs to earthworms is linked to oxidative damage, neurotoxicity, reduced detoxifying ability, imbalanced energy metabolism, and deprived purine and amino acid metabolism as a result of uptake of PE-MPs. The results of this investigation will improve our comprehension of the molecular toxicity processes of PE-MPs and aid in a more precise evaluation of the ecological hazards that PE-MPs pose to the soil and human being through food chain.

B-43. Microalgal bioassay of toxicity, physiology and chlorophyll content extraction caused by heavy metals accumulation

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Cyanobacteria are prokaryotic, unicellular, photoautotrophic organisms that require morphological and physiological adaptations as they grow. One of the biggest environmental problems affecting soil and aquatic environments today is heavy metal pollution. Using biological materials and metabolic processes or physicochemical mechanisms of uptake, biosorption is a state-of-the-art technique that removes heavy metals from wastewater. We looked into how different *Calothrix* species responded metabolically to the toxicity of two heavy metals, As^{3+} and $Pb^{2+.}$ Under growth conditions, these filamentous cyanobacterial species can grow in enormous quantities, producing useable biomass with little effort. Several *Calothrix* species were cultivated in BG-11 culture medium under carefully regulated light, air supply, and temperature conditions. The isolates' capacity to withstand specific heavy metals (such as arsenic trioxide and lead nitrate) under experimental conditions was then investigated. Because of its great capacity to absorb heavy metals, *Calothrix* has demonstrated promise in the biological management of pollution. *Calothrix* algae that were developing exponentially were exposed to different As and Pb concentrations (2µM and 5µM). Over the course of six days, the experiment was repeated at intervals of 0, 3, and 6 days, and the amount of chlorophyll was measured. Using a spectrophotometer, the response of chlorophyll was measured at $\lambda = 650$ and $\lambda = 665$ nm. Because microalgae are so prevalent on Earth, they have a great deal of potential to be developed biota. The study of microalgae and its use in pigment analysis yields valuable insights on chemical substances that can be turned into medications, including carotenoids and chlorophyll roomates. Although the chlorophyll content of microalgae like *Calothrix* has been recognised, nothing is known about how to optimise pigment production during the microalgae life phase. Our findings showed that as the concentration of these two heavy metals increased, the amount of chlorophyll progressively reduced.

B-44. Comparative analyses on carotenoids content in Phormidium sp and Oscillatoria sp on exposure to heavy metals

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Cyanobacteria are among the most common organisms in the environment. An ecosystem's ability to function may be affected by human activities that influence the activity and community structure of microorganisms. The purpose of this study was to examine how heavy metals, specifically lead and cadmium, impact carotenoid levels in cyanobacteria. Depending on their concentration and chemical form, heavy metals can have different effects on microbial activity and community structure. This study used two cyanobacterial genus, *Oscillatoria sp*. and *Phormidium sp.,* known for their physiological and morphological traits. The species were cultured in BG11 medium, and two different concentrations of lead and cadmium (0.002 µg/100 ml and 0.005 µg/100 ml) were used to assess toxicity levels. The experiment lasted six days, with assessments conducted at 0, 3, and 6 days, measuring carotenoid contents and metal-induced shifts. The spectrophotometer was used to measure the carotenoids' responses at $\lambda = 450$ nm. The results demonstrated that *Phormidium* and *Oscillatoria* responded differently to metal exposure. Lead caused fewer OD changes as its concentration increased, cadmium led to great decrease in carotenoid content. Overall, cadmium caused significantly greater inhibition than lead in both species. Under Pb and Cd stress, *Oscillatoria* exhibited a dramatic decline in carotenoid content and photosynthetic efficiency. Conversely, *Phormidium* was less affected, likely due to its enhanced capacity to absorb heavy metals, stronger antioxidant defenses, and higher carotenoid levels under stress.

B-45. Computational Screening and Molecular Dynamics Simulation of Flavonoids from Ocimum gratissimum as Potential Alpha-amylase Inhibitors for Type 2 Diabetes Mellitus

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BACKGROUND: Type 2 Diabetes Mellitus (T2DM) is a chronic metabolic disorder characterized by insulin resistance and high blood sugar levels which can result in serious side effects such as renal failure, neuropathy, and cardiovascular disorders. Alpha-amylase is a crucial enzyme that catalyzes the conversion of carbohydrates into glucose and is involved in blood sugar**.** *Ocimum gratissimum L*., commonly known as African basil, is medicinal plant traditionally used in various culture for its potential therapeutic properties.

METHODS: In this study, computational screening and molecular dynamics simulations were used to evaluate compounds from *Ocimum gratissimum L*. as potential alpha-amylase inhibitors for T2DM management. The compounds were subjected to molecular docking studies, where each was docked into the active site of the alpha-amylase enzyme to assess binding affinity and predict inhibitory potential.

RESULTS: Several compounds from *Ocimum gratissimum L*. were identified as potential inhibitors of alpha-amylase. These compounds showed strong binding affinities, with values ranging from -9kacl/mol to -7.8kcal/mol. Molecular dynamics simulation (200ns) confirmed the stability**.**

CONCLUSION: The computational screening and molecular dynamics simulations identified promising compounds from *Ocimum gratissimum L*. that could inhibit alpha-amylase, providing potential therapeutic benefits for managing type 2 diabetes mellitus.

B-46. Awareness and modern technologies of identification of snakes saves thousands of lives

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According to an estimate 58,000 Indians die from snake bites each year. (WHO, Supreme court PIL,) Accepting PIL Writ Petition (Civil) Diary No. 48030/2024/13-12-24) by the bench of Supreme Court Justice BR Gavai and Justice KV Viswanathan, Honb'le Supreme Court issued notice to the State Govts and UTs to do something' about snakebite treatment crisis particularly to conduct Awareness programmes and availability of Anti Snake Venom in Hospitals in adequate quantity. India is represented by about 367 species of snakes (ZSI). Out of these only 60 species are venomous. Most snake bite death are due to four species, Cobra (Naja naja), Krait (Bungarus caeruleus), Russel's Viper (Daboia russelii) and saw scale viper (Echis carinatus). Habitat encroachments and destruction has resulted in serious problem of human-snake conflict. In a study under ICSSR project on Human-Snake conflict in Eastern Ghats lack of awareness, delayed treatment and non availability of ASV in adequate quantity was found main cause Death. Awareness programmes with audio video and printing material have been conducted under the "Sarp Shiksha Abhiyan" for villagers, students teachers, Defense, Police, Jail, Forest personnel's etc. Awareness programmes include identification of snakes with modern technologies of acoustics, what to do and what not to do after snake bite. Results are very encouraging. In Rajasthan about 2700 snake bite deaths (before, 2022) after vigorous awareness programmes only 54 (2024). Now people don't kill snakes as a reaction response, this would enhance ASV production also. Such awareness programmes in an organized way be conducted throughout the country as per direction of SC.

B-47. Precision Management of Crop Fields: A Comprehensive Review

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Agriculture is a vital sector for the economic growth of a country, as it meets the needs of both its own population and others around the world. According to the Food and Agriculture Organization (FAO), about 2.5 billion people globally rely on agriculture for their livelihoods. Globally, agriculture is facing significant challenges due to climate change and declining soil health. At the same time, the continuously growing human population exacerbates these issues. Organic matter (OM) is vital for maintaining soil fertility and productivity, while also providing essential ecosystem services. Consequently, the agricultural sector is under increasing pressure to enhance both productivity and sustainability. Precision agriculture (PA) is an innovative approach to agricultural management that utilises advanced technologies and data-driven methods to improve crop productivity and resource efficiency. This approach focuses on site-specific management, recognising that spatial variability within crop fields due to differences in soil type, moisture content, nutrient availability, and other environmental factors affects how crops respond. By incorporating sensors, remote sensing, geographic information systems (GIS), global positioning system (GPS) technology, and data analytics, precision agriculture aims to customise interventions such as fertilisation, irrigation, and pesticide application to match local conditions within the field. The primary goals are to enhance crop yields while also increasing resource-use efficiency and promoting environmental sustainability by reducing waste and minimising negative ecological impacts.

B-48. In silico insights into insecticidal and antiviral potential of Karanjin from Pongamia pinnata

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Natural phytochemicals are increasingly investigated as sustainable alternatives to synthetic pesticides and antivirals. Karanjin, a furanoflavonoid from *Pongamia pinnata*, has been reported for its pesticidal and pharmacological activities. Cotton leaf worm (*Spodoptera litura*), a destructive pest, and Newcastle disease virus (NDV), a major avian pathogen, continue to cause significant agricultural and economic losses, underscoring the need for dual action of natural compounds. This study aimed to evaluate the bioactive potential of karanjin against both insect and viral protein targets using molecular docking. The 3D structures of *S. litura* acetylcholine esterase (AChE) and NDV proteins (HN and N) were retrieved from the PDB, while the 3D structure of karanjin was obtained from PubChem. Docking was performed using AutoDock Vina, and ligand-protein interactions were analyzed with Discovery Studio Visualiser. Karanjin exhibited a strong affinity for AChE protein (-9.8 kcal/mol), which was comparatively higher than that of malathion (-8.52 kcal/mol). Interaction stability was maintained through hydrogen bonds, reinforced by π–π stacking and van der Waals forces, indicating inhibitory potential. For NDV, Karanjin showed notable binding affinities with HN and N protein (-9.03 kcal/mol and -7.4 kcal/mol, respectively). Among the viral proteins, HN displayed the most stable interactions through hydrogen bonding and hydrophobic contact, while binding with the N protein suggested possible interference in viral RNA encapsidation. Collectively, these findings indicate that karanjin may disrupt both insect enzymatic activity and viral attachment, entry, and replication pathways. Overall, the integrated *in silico* analysis suggests that karanjin is a promising plant-derived candidate with both insecticidal and antiviral potential.

B-49. Genome-to-Proteome pipeline for Mesua ferrea reveals enzymatic and structural components of seed oil accumulation

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Mesua ferrea L., an evergreen tree native to South and Southeast Asia, is valued for its timber, medicinal applications, and as a non-edible oilseed with potential for biodiesel production. However no species-specific proteomic resources exist, thereby limiting advanced molecular studies, functional genomics, and biotechnological applications related to its improvement and utilization. We addressed this by developing a species-specific, nonredundant protein FASTA collection from two available genome assemblies (Illumina draft and chromosome-scale). Using annotation scans, we identified 2,905 unique proteins, including 44 Enzyme Commission (EC) classes spanning fatty acid synthesis, elongation, desaturation, and triacylglycerol (TAG) assembly. Cytoscape-based network construction integrated enzymes with structural proteins such as oleosin, caleosin, steroleosin, lipid-droplet–associated proteins, and nsLTPs, collectively linking catalytic steps to oil body formation. Our work provides the first proteome resource for M. ferrea and establishes a foundation for seed proteomics, lipid metabolism studies, and comparative analysis in biodiesel-relevant oilseeds.

B-50. NMR-based Metabolomics: A Powerful Approach for Characterizing Developmental Changes in the Haemolymph Metabolome of Bombyx mori

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Metabolomics, which is based on NMR analytical technology to systematically acquire the qualitative and quantitative information of low-molecular-mass endogenous metabolites, provides a direct snapshot of the physiological condition in biological samples. Unbiased measurements of an organism's metabolic composition can in principle be used to identify novel biomarker profiles and modes of action of stressors. Silkworm is a typical representative of the lepidopteran insects and has great importance in agriculture and the economy, and referred as holometabolous insect because it has four major developmental stages: egg, larva (with five instars), pupa, and adult (moth). Metabolite profile of the endogenous low molecular weight metabolites present in the haemolymph of developing silkworm were investigated by using 1H NMR. The levels of these small molecule metabolites change during development. Some metabolites are present at relatively high levels during the feeding period of larval life, but decrease at the onset of wandering. Here we discuss the capacities of NMR in the acquisition of essential biochemistry information in terms of the dynamic metabolic changes during development, and address the potential promise and diverse applications of NMR-metabolomics.

B-51. Understanding Soil Carbon Processes: Discovering Carbon Turnover and Mineralization Pathways in Various Ecosystems of The Nilgiri Hills

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Land use change (LUC) is the major contributor to the rise in the atmospheric CO2 and it shapes ecosystem functions. There is a little data on how various land uses affect soil CO2 emission in the biodiversity rich Nilgiri Hill Region (NHR). Using the kinetic models such as zero order, first order, parabolic diffusion, and power function this study examined the dynamics of carbon emissions across the six ecosystems (evergreen forest, deciduous forest, scrubland, cropland, forest plantations, and tea plantations) of NHR. The highest emission rates were found in cropland (91.64 t ha-1 yr-1) followed by tea plantations, forest plantations, scrublands, deciduous forests, and evergreen forests (16.71 t ha-1 yr-1). The power function gave the most accurate representation of all the models tested. While croplands and tea plantations emerged as the highest release of CO2, evergreen and deciduous forests have recorded relatively low emissions due to their ability to retain more carbon. This study emphasizes how land use has a significant impact on the carbon fluxes in the NHR and stresses how urgent it is to preserve the forest landscapes while improving carbon management techniques in plantation and agricultural systems in order to lessen the effects of regional climate change.

B-52. Harnessing alternatives irrigation sources implications for soil health, food safety, and human well-being

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With the increasing scarcity of freshwater resources due to climate change, urbanization and agricultural intensification to address the necessitates adoption of alternatives irrigation sources required to ensure sustainable food production. This study about the implementation of non-conventional water sources including treated wastewater, greywater, industrial effluents and desalinated water for irrigation with aimed at the implications for soil health, food safety and human wellbeing. Such alternatives sources reduce reliance on fresh water, particularly in water deficient regions. Alternatives irrigation sources can provide consistent water supply in such regions hence improve crop resilience and promote agricultural sustainability. However, their use contributes potential risks such as soil salinization, heavy metal accumulation and the transmission of pathogens which can affect crop safety. Effective implementation of non-conventional water sources requires a interdisciplinary approach combining advanced water treatment technologies, regular monitoring, farmer education and regulatory frameworks. Through an interdisciplinary approach, this research quantifies impacts of non-conventional water sources on soil fertility, microbial activity, nutrient cycling and contamination pathways to crop and consumers. The study also addresses governance, regulatory frameworks and public perception with emphasizing the need for stringent quality standards and integrated water management strategies with proper treatment and monitoring, contribute to sustainable agriculture, enhanced food security and long-term human health.

B-53. Effect of Thermal Power Plant Effluent and Fly Ash on the Growth and yield of Agricultural Crops: A Review

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The disposal of fly ash and wastewater from thermal power plants causes significant economic and environmental problems. These waste products may be harmful to agricultural environments because they frequently include heavy metals, hazardous substances, and high quantities of salt. Fly ash is considered an environmental hazard worldwide since it generally contains organic pollutants and probable toxic metals like Se, As, B, V, Al, Pb, Hg, and Cr. Although fly ash contains toxic substances, it also contains most of the oxides and trace elements. This review summarizes current studies on how fly ash and wastewater from thermal power plants affect the morphological and biochemical characteristics of important crops. Reports suggest that the presence of micronutrients at low concentrations in fly ash and diluted wastewater can enhance specific growth characteristics. Phosphate, sulfate, Ca, Mg, K, NO_3-N, and NH_3-N present in wastewater could be considered beneficial, as these are essential for the normal growth of a plant. The high concentration of elements K, Na, Zn, Ca, Mg, and Fe in fly ash also increases the yield of many agricultural crops. On the other hand, continuous or high-level exposure typically causes phytotoxicity and stress reactions. This review also highlights how treatment techniques, soil conditions, and plant species variety all affect the outcomes. The present review explores the Indian scenario of thermal power plant wastewater and fly ash incorporation in different soils for improved crop production, safe consumption, and sustainable agriculture.

B-54. Osteoimmune Modulation by Arthrospira platensis in Hepatocellular Carcinoma: Implications for Cognition

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Hepatocellular carcinoma (HCC) is not limited to the liver—it disturbs immune regulation and bone health, creating systemic inflammation that may also affect cognition. This study explored whether *Arthrospira platensis* (spirulina), a natural nutraceutical, could counteract these changes through osteoimmune modulation. HCC was induced in mice using Diethyl nitrosamine (DEN). Animals were divided into control, HCC-induced, and HCC + *A. platensis* groups. Bone quality, immune cell balance, cytokine levels, and oxidative stress markers were measured to assess systemic alterations. Mice with HCC showed pronounced immune imbalance, elevated IL-6 and TNF-α, higher oxidative stress, and significant deterioration of bone mineral density. Supplementation with *A. platensis* improved bone microstructure, normalized immune responses, reduced pro-inflammatory cytokines, and enhanced antioxidant defenses. The overall improvement in systemic health indicates a potential benefit for preserving brain function, as immune and metabolic stability are tightly linked to cognition.

A. platensis helped restore osteoimmune balance in HCC-induced mice by combining antioxidant and immunomodulatory effects. Beyond liver and bone health, such systemic improvements may indirectly safeguard brain and cognitive functions. These findings underline the value of targeting peripheral systems to support mental well-being and bridge preclinical research with clinical applications.

B-55. Traumatic Brain Injury in Drosophila: Neuronal Dysfunction Leading to Cognitive and Memory Impairment

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Traumatic brain injury (TBI) is a significant global health issue that causes acute neurological problems and long-term neurodegeneration. *Drosophila melanogaster* offers a genetically tractable, cost-effective system with conserved neural circuitry. The fly midbrain contains neuronal networks analogous to vertebrate brain regions, enabling the investigation of injury-induced behavioral and molecular changes. This study established a reproducible spring-based TBI model to investigate survival, locomotor, circadian behaviour, oxidative stress, neuroinflammation, autophagy, and progressive neuronal loss. Oregon R+ flies were subjected to TBI using a spring-based HIT apparatus, while sham flies were taken without injury. Assessments included mortality index (MI24), lifespan, cognitive and memory impairment, oxidative stress markers (LPO, H_2O_2, SOD), cell viability, gene expression (antimicrobial peptides, neuroinflammatory, and autophagy), and progressive neuronal loss. TBI resulted in the elevation of the mortality index and reduced lifespan in a severity-dependent manner as compared to Shams. Injured flies exhibited pronounced behavioral impairments, including cognitive and memory deficits, locomotor dysfunction, and disrupted circadian rhythms. Oxidative stress markers, including LPO, H_2O_2, and SOD activity, were increased, and cell viability was reduced. Additionally, expression of neuroinflammatory and autophagy-related genes was significantly upregulated. Progressive neuronal loss was observed in the midbrain of injured flies. TBI in flies induces cognitive, locomotor, and circadian impairments along with molecular and neuronal pathology, establishing a robust model for studying behavioral consequences of TBI and potential therapeutic strategies.

B-56. Utility of Azolla as Organic Compost on Various Medicinal Plants

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Azolla is a little plant that is home to an endosymbiotic colony in its dorsal lobe chamber. This cavity houses *Anabaena azollae*, which is a filamentous nitrogen fixing cyanobacteria. Due to this unique association between fern and cyanobacteria holds agricultural significance due to the nitrogen contribution that Azolla can potentially introduce to fields. As a small aquatic fern that thrives in calm swamps, ponds and lakes *Azolla* (*Azolla filiculoides*) has a symbiotic association with Cyanobacteria, especially *Anabaena azollae* that is found in the dorsal lobes of its leaves, and this gives it the extraordinary capacity to fix atmospheric nitrogen. This study is aimed at the impact of *Azolla* as organic compost on growth and composition of 100 days old Safed musli (*Chlorophytum tuberosum* L.), Sarpagandha (*Rauvolfia serpentina*) and Chirchita (*Achyranthes aspera*) plants. These crops were cultivated in soil pot culture conditions and treated by different doses of *Azolla* as green manure. After 100 days of cultivation, the plants were studied for dry matter yield, chlorophyll, ascorbic acid, nitrogen and crude protein contents which showed significant growth. Thus *Azolla* can be considered as a better organic compost for medicinal plants.

B-57. Carbendazim fungicide induced haematological, biochemical and histopathological changes to the liver and kidney of male albino rats (*Rattus rattus*)

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Carbendazim fungicide is a systemic broad-spectrum fungicide. controlling a wide range of pathogens. It is also used as a preservative in paint, textile, papermaking and leather industry, as well as a preservative of fruits. In the present. study, carbendazim was administered at 0, 150, 300 and 600 mg/kg per day doses orally to male rats (Rattus rattus) for 15 weeks. At the end of the experiment, blood samples, liver ver and kidney tissues of each animal were taken. Serum enzyme activities, and haematological and biochemical parameters were analysed. In toxicological tests, 600 mg/kg per day doses of carbendazim caused an increase of albu min, glucose, creatinine and cholesterol levels. Also, at the same doses, white blood cell and lymphocyte counts decreased. However, mean cell hemoglobin and mean cell hemoglobin concentrations increased. Histopathological examinations revealed congestion, an enlargement of the sinusoids, an increase in the number of Kupffer cells, mononuclear cell infiltration and hydropic degeneration in the liver. At the highest doses, congestion, mononuclear cell infiltration, tubular degeneration and fibrosis were ob-served in the kidney tissue. These results indicate that 300 and 600 mg/kg per day carbendazim affected the liver and kidney tissue and caused some changes on haematological and biochemical parameters of rats. Human & Experimental Taxicology (2001) 20, 625-630.

B-58. Deciphering the role of hepcidin in iron metabolism and anemia management

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Anemia is one of the most prevalent health conditions globally, primarily marked by inadequate erythrocyte production. Its occurrence branches from a multitude of complex factors, including chronic illnesses, genetic abnormalities, and nutritional deficiencies. This review specifically examines anemias associated with impaired hepcidin synthesis. Hepcidin, a peptide hormone predominantly synthesized by hepatocytes, plays a central role in iron regulation by modulating its absorption. Its mechanism involves binding to the iron exporter ferroportin, leading to its internalization and degradation. Disruptions in iron metabolism can have systemic effects, impacting not only haematological parameters but also vital organs such as the liver, kidneys, and brain. Maintaining iron homeostasis is essential for optimal physiological function. Although various blood-based biomarkers are used to evaluate iron stores, they possess inherent limitations. Hepcidin serves as a key regulator by inhibiting iron release from enterocytes and macrophages into the plasma. Understanding the molecular structure and functional dynamics of hepcidin is critical for elucidating its role in iron balance, with significant implications for diagnosing and managing distinct anemia subtypes. A strong association has been established between hepcidin dysregulation and iron deficiency. Despite its promise as a diagnostic biomarker, clinical implementation is constrained by the absence of a commercially available, validated assay. This review aims to provide a comprehensive analysis of hepcidin's regulatory function in iron metabolism and its relevance to the pathophysiology of various forms of anemia, thereby highlighting its potential in future research and clinical applications.

B-59. LC-QTOF-HRMS-based metabolomic profiling of the mangrove plant Sonneratia apetala Banks and its anticancer and anti-inflammatory activities

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Sonneratia apetala Banks traditionally consumed by local communities in Indian mangrove regions, is recognized for its nutritional and medicinal properties. The present investigation aimed to characterize the bioactive metabolites of the methanolic extract of S. apetala fruit (MESA) and evaluate the anticancer potential in Ehrlich Ascites Carcinoma (EAC)-bearing female Swiss albino mice. A phytochemical profiling through Liquid Chromatography-Quadrupole Time-of-Flight High-Resolution Mass Spectrometry (LC-QTOF-HRMS) led to the tentative identification of 19 secondary metabolites from diverse chemical classes. MESA exhibited notable in-vitro anti-inflammatory activity, with protein denaturation inhibition of 55.92 ± 1.94% (bovine serum albumin) and 77.49 ± 2.01% (egg albumin). MTT assay revealed significant cytotoxicity in EAC cells, with 50% inhibition (IC50) at 37.40 ± 3.03 µg/ml. In-vivo oral administration of MESA at 200 and 400 mg/kg body weight significantly improved mean survival time (MST) and increased life span in tumor-bearing mice. Tumor burden parameters, including tumor volume, packed cell volume, and viable/non-viable cell counts, were markedly reduced. Hematological parameters such as RBC, hemoglobin, monocytes, and lymphocytes were improved, while WBC and neutrophil counts were declined toward normal. Biochemical analysis indicated restoration of liver function enzymes, and enhanced antioxidant defense was evident through elevated enzymatic activity and decreased lipid peroxidation in liver and kidney tissues. Histopathological examination of liver tissues showed reduced necrosis, and enhanced hepatocyte regeneration in MESA treated groups. These findings collectively suggest that S. apetala fruit possesses promising anticancer potential, likely mediated through anti-inflammatory, antioxidant, and homeostatic mechanisms, supporting its traditional therapeutic use and further pharmacological exploration.

B-60. Carbon farming: A Nature based solution to achieve food security

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Soil is an often overlooked and underutilized tool in the fight against global warming. The earth's climate is undergoing rapid transformations due to ongoing human-induced emissions of Carbon Dioxide (CO_2) and other GHGs into the atmosphere. Nature based solutions (NBSs) are vital for the reduction of the increasing concentration of CO_2 from the atmosphere and store it into long lived carbon pools. Carbon farming emerges as a win-win strategy to mitigate climate change and improve farmer's income in developing countries. The carbon farming practices are best technology to encourage the adoption of regenerative farming options like conservation tillage, crop stubble management, mulching, cover-cropping, integrated nutrient management, conversion from annual to perennial crops or pastures, and livestock management. Carbon farming, as an innovative approach to scaling sustainable agriculture, has the potential to mitigate climate change while presenting farmers with additional income avenues through carbon credits. It is an emerging as a critical approach to addressing environmental issues and promoting a resilient future. Practicality and sustainability are functional advantages of carbon farming that make climate change mitigation more affordable for stakeholders. Understanding these perspectives is essential for effective policy-making and successful implementation of carbon farming in India. Machine learning models that incorporate depth related data from multiple electromagnetic induction sensors and gamma ray spectrometers have the potential to offer valuable insights in for soil health improvement.

B-61. Molecular Phylogenetics of Pseudecheneis Sulcata (Siluriformes: Sisoridae) Inferred From Mitochondrial Cytochrome C Oxidase I

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The phylogenetic status of *Pseudecheneis sulcata* (Siluriformes: Sisoridae), a less-studied sucker-throat catfish, remains unresolved due to the limited molecular evidence available. This research explores its genetic relationships through mitochondrial Cytochrome c oxidase I (COI) sequences. A total of 46 Sisoridae species, representing two subfamilies (*Glyptosterninae* and *Sisorinae*), were retrieved from the NCBI database through nucleotide BLAST searches, along with three newly generated sequences collected from natural habitats. Pairwise genetic distances were calculated, and a Neighbour-Joining (NJ) tree was constructed to evaluate divergence among species. Phylogenetic relationships were further analysed using Maximum Likelihood (ML) methods based on the best-fitting nucleotide substitution model. The resulting phylogenetic tree delineated several well-supported clades aligned with recognised taxonomic groups within Sisoridae. *P. sulcata* consistently nested within the *Sisorinae* lineage, forming a distinct clade closely related to some *Glyptothorax* species, indicating a shared ancestry and possible taxonomic revisions. Estimates of Genetic distance underscore intergenic divergence, while revealing relatively lower divergence between *P. sulcata* and its closest congeners. These findings provide the first molecular insight into the phylogenetic position of *P. sulcata*, contributing to a deeper understanding of evolutionary relationships within Sisoridae. And highlights the utility of COI-based analyses in resolving systematics of Sisoridae, with implications for biodiversity assessment and conservation planning.

B-62. Impact of chemical pesticides and wastewater on human health chain in Tomato (Solanum lycopersicum L.)

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Tomato (*Solanum lycopersicum* L.) is one of the most widely cultivated and consumed vegetable crop having high content of vitamins, antioxidants and lycopene. Tomato cultivation is highly susceptible to insect pests and fungal diseases cause intensive use of insecticides and fungicides. Yet these enhance productivity perhaps their residues often remain in fruits through which enter the human food chain. The risks are further intensified when crop is irrigated with untreated or partially treated sewage wastewater due to scarcity of pure water. Sewage wastewater contains heavy metals, chemical pollutants and pathogenic organisms, which on combined with pesticide residues cause bioaccumulation and amplified toxicity. Consumption of contaminated tomatoes has been linked to health concerns including gastrointestinal disturbances, neurological impairment, endocrine disruption, reproductive dysfunction, carcinogenesis and weakened immunity system. Residues of insecticides such as organophosphates, carbamates and pyrethroids, alongside fungicides like mancozeb, copper formulations and triazoles often exceed the maximum residue limits (MRLs) prescribed by international food safety standards. Heavy metals such as cadmium, lead and chromium from sewage water cause long-term health risks. Irrespective of human health such contaminants also deteriorate soil fertility, microbial activity leads to environmental degradation. The human health chain is thus impacted from pesticide application to consumers ingesting contaminated food produce. Adoption of integrated pest management (IPM) and treated wastewater reduce harmful impacts. Residue monitoring and awareness among farmers and consumers are essential for ensuring food safety and sustainability in tomato production.

B-63. Application of Computer in Fisheries Management, Development and Health Monitoring

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It has been reported that in communication research no single medium holds good in all situations and the same massage if transmitted through different sources will leave and imprint on the memory of the fishers. The differential sources credibility accorded by fishers demands the need to use multimedia for effective communication for technology. In fisheries management there are many applications of computer like data tabulation, processing and analysis. Storage and sharing of fisheries database and historic information products is encouraging the systematic analysis of past fisheries information. Their applicability to the assessment of commercial fish stocks in tropical developing countries is very essential. Very often data sets from a scientific perspective become valuable when they become longer in length and one is able to put the data into perspective. Length Frequency Distribution Analysis (LFDA) and Catch and Effort Data Analysis (CEDA) are software packages with analytical tools to guide and assist stock assessment and develop fisheries management policies in developing countries. Results provide managers with estimates of the potential yield of fish stocks, taking account of uncertainty and variable recruitment. The Length Frequency Distribution Analysis (LFDA) package is PC-based for estimating growth parameters and mortality rates from fish length frequency distributions and precautionary management advice. As far as concern with the Reservoir Fisheries in India, LFDA was used to estimate growth parameters of Catla, Mrigal and Roho in the Chulliar reservoir as part of the GTZ funded Indo-German Reservoir Fisheries Development Project, Kerala. The programme is now one of the standard tools used in the stock assessment of these species in this part of India. The objective of application of computer aids for fishers and fisheries professionals in reservoir fisheries development and management of fisheries activities to keep abreast of recent and potential future developments in their specific area of research and to familiarize them with advances in new technology and new application areas. Present overview papers on topic areas that represent the application of computer technology to fisheries research. Our aim is to provide critical reviews on the latest, most significant developments in selected topic areas that are at the cutting edge of the application of computers in fisheries and their application to the conservation and management of aquatic resources. Computers are also applied in fish health monitoring through Artificial Intelligence (AI) and Computer Vision, enabling automated analysis of video for disease detection, monitoring of behavior, and analysis of water parameters like temperature to predict health risks. Software also supports data archiving, diagnostics through multimedia tools, and the integration of data for better fishery management and decision-making.

B-64. Early Entry into Workforce and Cognitive Impairment in Later Life: Evidence from the Longitudinal Ageing Study in India (LASI)

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Cognitive health has been defined as an important aspect of healthy ageing. Decline in cognitive ability not only affects memory, decision-making but also the day-to-day function of individuals. Poor cognitive outcome in later life is directly associated with a reduction in overall quality of life. We used the Longitudinal Ageing Study in India (LASI, Wave-1, 2017–18) in this study to examine the association between early entry into the workforce and the risk of cognitive impairment in older adults. Our outcome variable is cognitive impairment, and the key predictor variable is age at start of first work, which we grouped into early age at work (less than 14 years) and late age at work (greater than 14 years). We used binary logistic regression model while adjusting for socio-demographic, health, and household factors. Our results show that older adults who started working before the age of 14 had a higher probability of cognitive impairment compared to those who started working later, with predicted probabilities of 9.1% and 7.9% respectively. Our model indicated excellent performance (AUC = 0.82). Our findings suggest that early entry into the workforce negatively impacts cognitive health at later ages. We therefore emphasise the need to discourage child labour and ensure access to education. We believe that such measures will not only improve the well-being of children in the present but also lead to healthier cognitive outcomes in later.

B-65. Widespread Impacts and Challenges of Climate Change on Healthy Brain Development in India

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Great need for better health services in our country at this time. People of the lower class are being deprived of the health services provided by the Central Government and the State Government. Even in community health centers and primary health centers, lower class people are not getting proper treatment on time. Due to which most of the people face a lot of stress due to lack of timely access to better health services. Most of the lower class people live in slums. The climate there has an adverse effect on their brain. Climate change also has a major impact on the brains of small children and adults. Due to this, climate change also has a dangerous effect on their thinking, understanding and healthy intelligence. Climate change is such a deadly special reason due to which the thinking and understanding intelligence of a healthy brain gets impaired. Air pollution, water pollution, noise pollution, land pollution and chemical pollution continue to have a dangerous impact on the healthy brain of young children and adults in this region. For the development of a healthy brain, is a great need for pure environment, pollution free environment clean water, and rich nutritious diet. Replacing hot beverages with cold beverages is essential for healthy brain development. Even consuming cow's milk instead of buffalo's milk can prove to be very beneficial for the proper development of a healthy brain. In our country, there are many challenges on a large scale in the development of a healthy brain. It is a very challenging task for us to develop the brain of an addict into a healthy brain. That person's way of thinking, understanding and working intelligently is opposite to that of a healthy brain.

In special circumstances, it is common for those people to become aggressive and adopt criminal tendencies. Their brain structures may differ significantly from those of a healthy brain. Through brain wellness and medical science, we can conduct large-scale, successful research into healthy brain development. The role of the National Brain Research Center in this type of special work can also be commendable, which can continuously do the work of rehabilitation by developing the brain of people with criminal tendencies into a healthy brain.

B-66. Toxicity and Antifeedant activity of Gibberellic acid (GA3) against Aak grasshopper Poekilocerus pictus (Orthoptera: Acrididae)

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Its Calotropis plant, a valuable medicinal plant, has been traditionally employed in regions such as North Africa, the Middle East, South Asia, and Southeast Asia to treat a range of health issues. leaves are known for their ability to heal wounds quickly and address skin diseases and liver problems. Given its critical role in traditional medicine, there is a pressing need to safeguard Calotropis plant from the destructive impact of its major pest, Poekilocerus pictus. It also introduces the idea of using Gibberellic acid (GA3) as an eco-friendly insecticide to manage the Poekilocerus pictus population and protect Calotropis plant. The present study aims to investigate the toxic effect of GA3 on P. pictus. The study focused on the 5th instar nymphs of P. pictus. The results of the experiments revealed when P. pictus 5th instar nymphs were orally administered with different concentrations of GA3 (ranging from 1mg/ml to 9mg/ml), dose-dependent mortality was observed. Antifeedant assays demonstrated a marked reduction in leaves consumption rates by the 5th instar nymphs at the highest concentration 5mg/ml of GA3. This research suggests that Gibberellic acid (GA3) can serve as an eco-friendly insecticide to modulate the food consumption efficiency, growth, and survival of P. pictus. This finding has significant implications for the management of this pest, which poses a threat to the medicinal plant Calotropis spp. Protecting the plant's growth and ensuring its availability for traditional medicine is essential, and the study offers a promising approach to achieve this goal.

B-67. Phytochemical, bioactive and pharmacological compunds used as antidiabetic, antioxidants, anticancer, antimycotic activites from Cassia javanica Linn. plants

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Nature is a source of medicinal agents for many thousands of years, and an impressive number of new drugs have been isolated from natural sources, many based on their use in traditional 717 medicine. Medicinal plants play an important role for the growth of new drugs. Indian medicinal plants are now known to have great potential for preparing clinically helpful drugs that might even be used by allopathic physicians. *Cassia* species are well known medicinal plant commonly found in India and other tropical countries. Different medicinal properties have been attributed to this plant in the traditional system of Indian medicine. The genus *Cassia* comprises of 580 species of herbs, shrubs and trees. It is widely dispersed throughout the world, of which only twenty species are native to India. *Cassia javanica* Linn. plant is a small tree. It belongs to family- Leguminosae. It is commonly known as the apple blossom cassia, pink lady, apple blossom shower and java shower. It is widely cultivated in the tropical regions of Asia and India. Previous studies proved the presence of various phytochemical compounds as anthraquinone glycosides, flavonoids, alkaloids, sterols, tannins, saponins and reducing sugars in different parts of the plant. *Cassia javanica* Linn. plant has various pharmacological activities as antidiabetic, antioxidant, anticancer and antimycotic activities. It was used in traditional medicine to cure various diseases. It has been used as antipyretic, laxative and antimalarial drug. It is known to decrease virulence of pathogenic organisms. It is used in the treatment of gastric pain and cold. Due to complex nature of the disease there is a worldwide need for an ideal drug therefore, there are many antidiabetic herbs recommended in traditional medicaments. This review gives the information concerning the, chemical constituents. bioetivities of the plant.

B-68. Catharanthus Roseus As Spagyric Remedy

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There are around 350,000 different species of plants on earth, and each one has significant medical potential. The plant vinca, which is a member of the Apocyanacae family, is also known by the names catharanthus, sadabahar, and baramasi. It produces stunning blooms that might be white, blue, or purple in colour. The plant has the following chemical constituents, however the two that are most important to the medical sector are the following two. While vincristine is used to treat juvenile leukaemias, vinblastine is mostly utilised to treat Hodgkin lymphomas. Both chemical constituents frequently have harmful effects on human bodies, such as weakening of the muscles, anurexia, bone, and narrow depressions. Vinca's chemical component binds to tubulin to stop microtubule production and to stop mitosis during the metaphase. Numerous medical properties of vinca include anti-cancer, anti-diabetic, anti-microbial, and anti-ulcer properties. Vinca can be administered as combination therapy or as targeted therapy

B-69. Study on Inflammatory Response, Biochemical Profiling and Histopathological Alteration in Asian stinging catfish Heteropneustes fossilis Infested with Nematode parasites

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The pathological deformities and systemic inflammatory response induced by infection are considered to be an important feature of the pathophysiology of nematode parasites. In this study, the goal was to determine histopathology, oxidative status, and immunological response due to infection. A sample of thirty Heteropneustes fossilis (H. fossilis) fish was used for this purpose, of which fifteen were healthy and fifteen were naturally infected with a nematode parasite. After dissection, infection was confirmed during the examination of the fish. Infected liver tissue was observed for histopathological deformities as well as estimated oxidative stress parameters such as malondialdehyde (MDA), antioxidants, i.e., superoxide dismutase (SOD), catalase (CAT). glutathione peroxidase (GPx), glutathione reductase (GR), and glutathione content (GSH). We used liver tissue and blood serum for the estimation of carbohydrates, protein, and lipid. For health checkups, elemental mapping, hematological analysis, and some nutrition-related biochemical tests were performed. We found histopathological changes and Oxidative stress, i.e., MDA, were increased, but SOD, CAT, GPx, GR and GSH were decreased in the infected tissue of H. fossilis. We checked the immunological status and found higher expression of inflammatory cytokines in infected tissue compared to non-infected tissue. we also found that most of the minerals were decreased in EDS elemental mapping, and haematological parameters such as white blood cehs (WBCs) were increased, but the level of red blood cells (RBCs) decreased. Serum protein (g/dt:; was decreased, but glucose (mg/dL) was increased in the infected group. It can be stated tirot histological injuries, oxidative stress, and Pathological damage markers may increase in infect tissue, which sign of infection, as well as nutritional status decreases in naturally infected fishe with nematode parasites.

B-70. The Role of UPR in Microcystin-LR Induced Toxicity and the Potential Mitigating Effects of Coenzyme Q10

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Microcystin-LR (MC-LR), a potent hepatotoxin produced by cyanobacteria, is primarily associated with endoplasmic reticulum (ER) stress, leading to cellular dysfunction and toxicity. In this study, male mice were administered MC-LR at 10 µg/kg bw/day intraperitoneally for 14 days, while another group received MC-LR along with coenzyme Q10 (CoQ10, 10 mg/kg bw/day, intramuscularly) for 14 days. This study investigates the role of the unfolded protein response (UPR) in MC-LR-induced toxicity and evaluates the potential protective effects of CoQ10. The expression levels of key UPR markers, including GRP78, GRP94, IRE1α, XBP1, PERK, eIF2α, ATF4, and ATF6, was analyzed using Western blotting and quantitative PCR (qPCR). These findings reveal a significant upregulation of UPR markers GRP78 and GRP94, indicating the activation of UPR as a response to ER stress caused by MC-LR. Additionally, elevated levels of IRE1α, XBP1, and PERK were also observed, supporting the involvement of UPR pathways. Furthermore, increased transcriptional expression of ATF4 and ATF6 was validated by qPCR analysis, suggesting downstream engagement of stress-related signalling. Importantly, CoQ10 treatment markedly reduced the protein and mRNA expression of these UPR markers, indicating its ability to alleviate ER stress and restore cellular balance. These findings highlight the potential of CoQ10 as a treatment for reducing ER stress and cellular damage caused by MC-LR and offer a critical understanding of the involvement of UPR in MC-LR toxicity. This study highlights how crucial it is to target UPR pathways when creating treatments that protect against cyanobacterial toxins.

B-71. Agroecosystem Diversification for Sustainable Nutrition and Mental Well-Being

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Agroecosystems provide vital services such as food, fiber, bioenergy, and other ecosystem processes that benefit human well-being, such as brain health and cognition. Diversified cropping strategies protect agrobiodiversity while improving ecosystem services such as soil quality, nitrogen fixation, pollination, and insect control. Crop diversification is becoming more recognized as a method for adapting to changing climatic conditions while also improving nutritional security, which is a significant driver of mental and cognitive health. This study examined at increasing agricultural diversification methods in the Mirzapur district of eastern Uttar Pradesh. Dominant systems combined perennial fruit crops such as banana (Musa paradisiaca), phalsa (Grewia asiatica), sweet lemon (Citrus limetta), guava (Psidium guajava), and jackfruit (Artocarpus heterophyllus) with traditional crops including rice, wheat, mustard, and seasonal vegetables. These systems ensured year-round fruit availability, which increased dietary diversification and household nutrition intake. Soil samples from conventional and diverse systems were examined for physicochemical and microbiological characteristics. Citrus and banana-based systems exceeded wheat monocropping in terms of soil quality, nutritional content, water-holding capacity (42.4%), and microbial activity. The Banana + Turmeric system increased soil enzymatic activities, including FDHA (14.70%), ALP (15.53%), and ACP (13.87%), while Banana + Cabbage raised urease activity (17.43%). Metagenomic research found a larger number of beneficial taxa, including Rhodococcus and Mycolicibacterium. Economic analysis confirmed that diversified systems produce superior net returns. Overall, crop diversification increased agroecosystem resilience, soil fertility, biodiversity, and economic viability. By integrating ecological and nutritional benefits, these techniques promote brain function, cognitive growth, and mental well-being, emphasizing the link between sustainable agriculture and human health.

B-72. Effectiveness of Stellaria media in the management of Rheumatoid arthritis: An observational case study

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Rheumatoid arthritis (RA) is a chronic autoimmune inflammatory disease that leads to progressive joint destruction, deformity, and disability if untreated. It predominantly affects small joints but can involve larger joints and other synovial tissues. The prevalence of RA in India is about 0.75%, with a higher incidence in females. This observational study investigates the effectiveness of *Stellaria media* in managing RA symptoms. Conducted over nine months with 30 patients aged 30–60, it uses the Disease Activity Score (DAS28) for assessment. Homoeopathic treatment based on Hahnemannian principles was administered orally. Patients were followed up regularly to monitor disease progression and response. Data were analyzed statistically to evaluate symptom reduction and functional improvement. Results are expected to demonstrate the therapeutic potential of *Stellaria media* as a cost-effective alternative treatment. This study aims to support the integration of homoeopathy in RA management.

B-73. Yogasana as the Science of Human Life

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Asanas improve the condition of the body and mind and provide the body with the ability to fight diseases. The body has the ability to heal itself to a great extent. If the body is unhealthy and mind is stressed, then the body's immunity power decreases. Mental and emotional stability begins to develop only with the practice of asanas. The most basic and important thing in life is good health. Excellent health has three components - body, mind and consciousness. Yoga practice is only system which affects all three simultaneously. Therefore, yogic activities are effective in providing health in a comprehensive manner. Therefore, do not consider asanas as only physical exercises. In reality, there is purpose is very vast. The practice of asanas develops stability and unity in body, mind and consciousness. By practicing asanas regularly, a practitioner becomes the master of his body and mind. Daily systematic practice of asanas turns an ordinary person into in yoga practitioner. After yoga practice, the person feels relaxed. The body feels energetic and refreshed. Yoga practice leads to all three types of development - physical, mental and spiritual.

B-74. Age-dependent expression and genetic variation of Heat Shock Factor 1 (HSF-1) in Indian goat breeds under heat stress conditions

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Heat Shock Factor 1 (HSF-1) is a key regulator of heat shock proteins and plays a vital role in cellular defense against thermal stress. Physiological responses, including rectal temperature (RT), respiration rate (RR), and heart rate (HR), were recorded during the heat stress period, and animals were classified into two contrasting phenotypes. Sire, age group, period, and phenotype had significant effects ($p < 0.01$) on RT, RR, and HR. In the present study, 138 goats from four Indian breeds were selected to assess genetic variation in the HSF-1 gene using high-resolution melting (HRM) analysis. HRM analysis revealed four genotypes, and genotypic and allele frequencies were estimated in Barbari, Jamunapari, Jakhrana, and Sirohi breeds. Furthermore, the mRNA expression of HSF-1 was evaluated in peripheral blood mononuclear cells (PBMCs) of Jamunapari goats across different age groups and heat stress phenotypes. The relative quantification of HSF-1 varied with age and stress conditions, showing 0.399-fold at 3 months, 0.5312-fold at 9 months, and 1.755-fold at 12 months, and a markedly elevated level in adults (10.42-fold). Notably, differential expression between contrasting phenotypes revealed that heat stress-susceptible (HSS) individuals at 3, 9, and 12 months exhibited higher expression than heat stress-tolerant (HST) individuals, whereas at the adult stage, HST animals showed greater expression than HSS. These findings demonstrate that HSF-1 expression in goats is age-dependent and influenced by heat stress phenotypes. The study highlights the potential of HSF-1 as a molecular marker for understanding thermal resilience and adaptive capacity in Indian goat breeds.

B-75. Documentation of Indigenous Traditional Medicinal Knowledge of tribal communities of Chitrakoot region of Satna (M.P.)

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The dominant Ayurvedic system of medicine in India has been vogue for over 3000 years. Nevertheless, the folklore and ethnomedicines, particularly in tribal and rural area of India, are still playing a significant role in the treatment of ailments and diseases. But now the traditional knowledge and practices are disappearing and losing their intrinsic value at an alarming rate due to the shrinkage of forest areas and disappearance of indigenous culture and practices due to adoption of modern lifestyle. Keeping in this view the documentation of indigenous traditional medicinal knowledge in Chitrakoot region of Satna district of Madhya Pradesh has been conducted in various field visits for a year. The main tribal communities are Kol, Gond, Khairwar and Mawasi. They generally reside in and around the forest areas. The interviews were conducted from traditional healers/practitioners/vaidyas knowledgeable men and women in different villages. The first hand information regarding the indigenous traditional herbal formulations such as name of plants, parts used, ingredients, mode of preparation and application, dose and duration etc. were recorded in prescribed proforma. There are 90 plant species were reported during this study belonging to 83 genera and 42 families are used in different ailments and diseases.

B-76. The role of coenzyme Q10 in counteracting Microcystin-LR-induced oxidative stress and cardiac dysfunction

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Cyanobacterial blooms are hazardous for humans, animals and other aquatic organisms due to the production of toxic secondary metabolites known as microcystins which is a cyclic heptapeptide. Studies have suggested that besides the liver, the heart may be another target organ of Microcystin-LR (MC-LR) intoxication. Coenzyme Q10 (CoQ10) is an important vitamin-like substance that has been reported to be important for the proper functioning of many organs and biochemical reactions in a living system. Recent reports have indicated that CoQ10 supplementation may have a positive effect on various pathophysiologies. In the present study, BALB/c mice were randomly divided into 3 groups with 5 mice in each group. The animals of the normal control group (N) received water and normal diet *ad libitum* and MC-LR as well as the MC-LR+CoQ10 group received MC-LR (10µg/kg bw/day, ip) for 14 days. After two weeks of MC-LR treatment, mice of (MC-LR+CoQ10) received coenzyme Q10 (10 mg/kg bw, im) for 14 days. In the current study, CoQ10 normalized various antioxidant parameters in the heart that were altered due to MC-LR-induced toxicity. Thus, the findings indicate that coenzyme Q10 has the potential to be developed as a preventive therapeutic agent against Microcystin-LR-induced toxicity, implying that this treatment might ameliorate MC-LR-induced cardiotoxicity in mammalian systems.

B-77. Behavioral and Emotional Difficulties Linked to Smartphone Addiction in Children

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Children today are growing up in a world saturated with digital technologies. Early years are very important because emotional regulation, peer relations, academic self-concept, attention capacities are still forming. Smartphone addiction among children has emerged as a growing concern. This study focused on 60 children (30 boys, 30 girls) aged 11–14 years to examine the strengths and difficulties associated with smartphone overuse. Data were collected using a self-developed interview schedule, the Smartphone Addiction Scale (Dr. Vijayshri & Dr. Masaud Ansari, 2020), and the Strengths and Difficulties Questionnaire (Goodman, 1997). Addiction severity was categorized as low, moderate, or high based on standardized cut-off scores. Results revealed that a substantial proportion of adolescents (78.4%) demonstrated moderate to high levels of smartphone addiction. Higher addiction severity was significantly associated with increased emotional, conduct, attention, and peer-related difficulties, while lower levels of addiction corresponded with enhanced prosocial behavior, academic engagement, and healthier psychological adjustment. These findings underscore the importance of addressing smartphone use patterns during early adolescence, a critical developmental period, to safeguard positive psychosocial and academic outcomes. The study highlights the dual perspective of strengths and challenges, emphasizing the need for preventive strategies, parental guidance, and educational interventions to promote balanced smartphone use among children. In conclusion, the study's findings suggest that Early identification and intervention strategies should target children showing moderate addiction levels to prevent progression to high severity and associated Behavioral complications.

B-78. Appetite modulator Quercetin enhances antioxidant defence and neuroprotection in induced aging Rat model

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This study investigated the neuroprotective and antioxidant effects of a potent appetite modulator Quercetin in a d-galactose-induced accelerated aging model using male Wistar rats. Animals were assigned to four groups: control, Quercetin-treated, d-galactose-induced aging, and d-galactose and Quercetin treatment. Quercetin was administered orally (100 mg/kg) and d-galactose subcutaneously (300 mg/kg) for 28 days, in accordance with established dosing references.Biochemical analyses included measurement of ferric reducing antioxidant power (FRAP), glutathione (GSH) content, malondialdehyde (MDA), protein carbonyl (PCO) formation, and activities of superoxide dismutase (SOD) and catalase in brain tissue homogenates. Levels of appetite regulatory hormones leptin, ghrelin and insulin were also measure in serum. Gene expression of Beclin-1, ULK-1, SIRT1, NSE, TNF α, IL-6, GSHR, and GLP-1 was assessed by RT-PCR. Histopathological evaluation of hippocampal architecture was performed, and statistical significance was determined by ANOVA with Bonferroni post-hoc analysis. D galactose significantly reduced FRAP, GSH, SOD, and catalase activities while increasing MDA and PCO levels, alongside downregulation of autophagy and neuroprotection-related genes and elevation of inflammatory cytokines. Quercetin treatment effectively restored antioxidant markers, reduced oxidative stress indices, improved enzymatic activity, upregulated neuroprotective and autophagy-associated genes, and attenuated inflammation. Histopathological assessment confirmed preservation of neuronal structure in treated rats. Quercetin supplementation robustly enhances cerebral antioxidant defenses, mitigates oxidative damage, modulates gene expression related to neuron survival and inflammation, and confers histological neuroprotection in experimental aging.

B-79. Impact of adulterations in mustard oil inducing human health risks

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Adulteration of mustard oil other similar appear oil such as palm oil has emerged as a critical issue affecting food quality, human trust and health. Mustard oil traditionally valued for its high content of mono and polysaturated fatty acids, omega-3 α-linolenic acid and bioactive compounds with cardioprotective and antimicrobial properties is often substituted with palm oil having economic incentives and easy market availability. Palm oil however contains a high proportion of saturated fatty acids particularly palmitic acid which is associated with elevated low-density lipoprotein (LDL) cholesterol, obesity, insulin resistance and cardiovascular disorders. In-addition refining and repeated heating of palm oil produce toxic contaminants such as 3- mono chloropropane-1, 2- diol (3- MCPD) esters, glycidyl esters and aldehydes compounds with proven genotoxic and carcinogenic potential. These adulterants compromise the nutritional value of mustard oil while silently increasing the burden of non- communicable diseases in population heavily reliant on edible oils for daily cooking. Detection of such adulteration remains a challenge necessitating the development of sensitive, rapid and cost- effective analytical techniques. Methods such as gas chromatology, Fourier- transform infrared (FTIR) spectroscopy, differential scanning calorimetry and chemometric approaches have shown potential in distinguishing mustard oil from palm oil admixtures. Ensuring authenticity through robust detection protocols, strict regulatory enforcement and consumer awareness is essential to safeguard public health. Addressing adulteration not only protects nutritional integrity but also prevents the long- term health hazards associated with unsafe food practices.

B-80. Genotyping of the KISS 1 Gene in Bundelkhandi Goats Using HRM Analysis

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Goats (*Capra hircus*) are an important livestock species, valued for their milk, meat, and adaptability to diverse environments. Improving reproductive efficiency is critical for enhancing productivity, and molecular markers play a key role in selective breeding. The KISS1 gene, which encodes the neuropeptide kisspeptin, regulates the hypothalamic–pituitary–gonadal (HPG) axis and is essential for puberty onset, estrous cycles, and overall fertility. Polymorphisms in KISS1 are associated with traits such as litter size, age at first kidding, and kidding interval, making it a promising marker for reproductive improvement.In the present study, blood samples (n = 72) were collected from Bundelkhandi goats to investigate genetic variation in the KISS1 gene. Genomic DNA was isolated using the phenol–chloroform method, and its purity and quality were confirmed by biophotometer and agarose gel electrophoresis. The optical density (OD) ratio at 260/280 ranged between 1.75 and 1.85, indicating suitability for further experiments. A 300 bp fragment of the KISS1 gene was amplified by PCR, and genotyping was performed through **High-Resolution Melting (HRM) analysis**, a highly sensitive technique for detecting single nucleotide polymorphisms (SNPs). HRM results revealed three genotypes with frequencies of 15.28% (Red), 9.72% (Green), and 75.00% (Blue). These results confirm the presence of genetic polymorphism in the KISS1 gene of Bundelkhandi goats and highlight the utility of HRM as a reliable tool for molecular characterization. The findings provide valuable insights for marker-assisted selection strategies aimed at improving reproductive efficiency and ensuring sustainable goat production.

B-81. Geographical mapping of black rice from Assam and Manipur using IRMS & ICP-MS

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The north-eastern region of India, notably Assam and Manipur, are prominent producers of nutrient-rich black rice. Its quality changes under different climatic and geo-chemical conditions; therefore, geographical identification is crucial for quality control and authentication. Manipur varieties especially Chak-hao have Geographical Indication (GI) Tag and are well examined. Assam black rice exhibits some unique features, but no report exists regarding its geographical origin till date. However, being a neighboring state, it is believed to have originated from Manipur but not scientifically proven. As the agro-climatic conditions of Assam are also suitable to produce black rice, there could be a possibility of a distinct geographical origin strictly restricted to the state. This work aims to identify the variables that could distinguish the geographical fingerprinting of 9 black rice samples from Assam with 3 samples of Manipur using stable isotope ratios (δC, δN, δH) and multi elemental content using IRMS and ICP-MS. Results showed that Manipur accessions (WI, EI, TH) consistently exhibited higher $\delta^{15}N$ and more depleted $\delta^{2}H$ values compared to Assam samples, suggesting unique agro-ecological conditions and possibly more conserved cultivation practices. In contrast, Assam landraces displayed a wider isotopic range, with some (UG, DR, KR) overlapping partially with the Manipur cluster, implying shared ancestry or gene flow. Elemental profiling further supported this distinction: Manipur rice showed relatively uniform Mg and K contents and higher Li in EI and TH, while Assam accessions were more heterogeneous with broader variability in Sr, Zn, and K levels. Detailed information will be presented.

B-82. Multi-Targeted Neuroprotective Effects of Diosmin in an Aβ42-Induced Drosophila Model of Alzheimer's Disease

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Alzheimer's disease (AD) is an age-related neurodegenerative disorder characterized by progressive memory loss and cognitive decline, primarily associated with amyloid beta ($A\beta_{42}$) and Tau pathology. $A\beta_{42}$ accumulation disrupts mitochondria, elevates ROS, and induces oxidative stress–mediated apoptosis and neuroinflammation. Increased acetylcholinesterase (AChE) activity further exacerbates cholinergic dysfunction and $A\beta_{42}$ aggregation. Current FDA-approved AD drugs provide only symptomatic relief and have adverse side effects. Thus, Phytomedicine is being explored to develop safer and more effective therapeutics for AD. In this study, we employed an $A\beta_{42}$-induced AD model of *Drosophila melanogaster* to evaluate the multi-targeted therapeutic potential of the naturally occurring flavonoid Diosmin. Drug toxicity analysis in wild-type (Oregon R^+) and AD flies. *In vivo* cellular ROS detection using H2DCFDA stain, Superoxide dismutase (SOD), Lipid peroxidation (LPO), and catalase assay were performed to measure the oxidative stress level. Mitochondrial membrane potential and morphology were analyzed by endogenously expressing mito-GFP and Mito-Tracker red dye staining. AChE activity assay, apoptosis detection, Immunostaining, and western blotting against $A\beta_{42}$ and JNK. Diosmin treatment significantly reduced intracellular ROS levels in AD flies, decreasing oxidative stress markers and protecting against oxidative stress-induced cell death. It restored altered mitochondrial morphology and membrane potential and significantly decreased acetylcholinesterase activity. Moreover, Diosmin administration reduced amyloid-β aggregates and downregulated stress-activated protein kinase JNK levels. Diosmin exhibits multi-targeted neuroprotective effects in AD flies by lowering oxidative stress, maintaining mitochondrial integrity, and modulating key pathological markers such as AChE, amyloid-β, and JNK.

B-83. Effect of Gut Microflora On Behaviour And Development Of Human Brain

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The gut encases a vast external surface area of human body and faces several extraneal influences. The activity of brain in concert with commensal bacteria in the gut to scan ably the huge chemical signals that penetrate the gut daily. The theory of microbiota-gut-brain axis revealed the considerable impact of the microbiota present in gut on the brain. The present paper focusses evidence that gut bacteria may modify development of brain and its etiquete, processes by means of which gut bacterial flora convey with the brain, pre-clinical and clinical examinations to demonstrate the effect of gut microflora on autistic disorder, and variables noteworthy consideration by emerging research on gut bacteria.

B-84. Lichens – A Promising Plant for Neurodegenerative Disease Treatment

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Several neurodegenerative diseases are most well-known and widespread among human beings. One such disease is Alzheimer disease that damages memory and behavior of older people's. The common symptoms are gradual memory detriment and certain neurocognitive functions leading to backlash in various functions of daily living. Till date no drug is there for the treatment of this neurodegenerative disorder. Lichens exhibit important therapeutic properties in various neurological diseases, including Alzheimer's disease. Several bioactive compounds isolated from lichen have been tested for anti-acetylcholinesterase potential which might play a pivotal role to prevent such dementia. This review paper deals with previous research on the therapeutic potential of some lichens and their bioactive chemicals for neurodegenerative diseases. Thus, chemical compounds isolated from lichens can be considered promising for the prophylaxis and treatment of neurodegenerative diseases in near future.

B-85. A concise review on Bacopa monnieri L: A neuroprotective and cognitive-enhancing plant

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Prevalence of neurodegenerative conditions are found in recent times among the aged global population. Bacopa monnieri L., an herb full of bioactive compounds, viz., loliolide, bacosides, betulinic acid, quercetin, asiatic acid, etc., are beneficial for brain health. There is paucity of data regarding the therapeutic uses of this plant in neurological disorders. Bacopa monnieri has antioxidant and anti-apoptotic properties and can, accelerate kinase activity, repair damaged neurons, regenerate synaptic function, increase neuroprotection and improve nerve impulse transmission. Clinical trials revealed that Bacopa monnieri can minimize Nuclear Factor-κB phosphorylation, accelerate cognitive functions, emotional activity, hyperactivity, distress, sleep cycle,melancholy, , learning problems, inattention, remembrance, thoughtlessness, and psychiatric problems. Moreover, the plant can lower the pro-inflammatory biomarker level and oxidative stress This review aims to focus the therapeutic role of this plant in brain disorders. Here, we emphasize that this Bacopa plant has profund therapeutic potential and can serve as an alternative method of tratment of patients suffering from nerve diseases.

B-86. Comparative study of moisture dynamics in the soils of two different sugarcane-based cropping system (viz – intercropping and sole) in Western Indo-Gangetic plains of Uttar Pradesh

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Soil water plays important role in soil-plant consortium in which plant absorbs from soil. Thus, soil acts as reservoir of water towards its proper growth. Sugarcane among the cash crop needs large quantity of water during its life-cycle. Hence, dynamics of water in soil were studied from two major sugarcane-based cropping pattern (intercropping and sole) at three depths at 15 cm interval (0-45 cm). The result invoked that soils were sandy-loam to sandy-clay-loam textured under different cropping system and depth. The increase in the clay content down the depth elevates the holding capacity of water via clogging the pore spaces under all the cropping system and depth. Therefore, the difference in behaviour is mainly attributed to the difference in cropping system only. Intercropping system showed high bulk density, low organic carbon, high clay:carbon ratio, high porosity and high E.C. compared to the sole sugarcane-based cropping system. The moisture dynamics under all cropping system behaved quadratically and attains minimum value. The other moisture parameter derived from the moisture loss curve indicates that intercropping has high moisture loss, high instaneous loss and low average moisture content.

B-87. An innovative machine learning-based QSAR approach for prediction and structural analysis of novel/repurposed acid ceramidase (ASAH1) inhibitors for glioblastoma therapy

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Acid ceramidase (ASAH1), a lysosomal enzyme that regulates ceramide and sphingosine-1 phosphate balance, has emerged as a promising therapeutic target in Glioblastoma. Inhibiting ASAH1 by carmofur elevates ceramide levels, inducing apop-tosis in Glioblastoma cells. However, its clinical application is limited by its instability & toxicological concerns, thereby necessitating the search for more effective inhibitors. We employed an innovative machine learning-quantitative struc-ture–activity relationship (ML-QSAR) approach to investigate & identify related bioactive ASAH1 inhibitors. Herein, we report the results of ML-QSAR modeling utilizing a filtered dataset of 103 inhibitors from ChEMBL & 431 3D descrip-tors. Multiple algorithmic steps, incorporating top five ML models, were implemented. Among these, our tuned extra trees regressor (ETR) model achieved the highest predictive performance (R2=0.867, RMSE=0.248). Q2(LOO) & Q2(LMO) demonstrated 79.22% & 76.92% (Q2>0.5) of inhibitors to be well-predicted, respectively. Descriptor ablation studies iden-tified radial distribution function 20s (RDF20s) and SHAP analysis further demonstrated RDF20s, DPSA-1 & TDB2p as the key structural & pharmacological features. Utilizing this ML-QSAR model, a virtual screening identified 77 promising candidates with N-hexylsalicylamide as the top-most candidate in the ranked list, with superior ADME/T and pharmaco-kinetic characteristics. Notably, Cys143, the key active site residue essential for carmofur interaction, was also observed to be in contact with carbonyl group of N-hexylsalicylamide. MM/PBSA-derived BFE calculations from MD simulations showed that N-hexylsalicylamide had higher negative BFE than carmofur. Following SHAP analyses-based mechanistic interpretations, structural modifications of selected inhibitors led to the design of novel analogs for further testing.

B-88. Interrogating LncRNA Interactions with mRNAs and Protein in Pan-Cancer Gene Expression and Drug Sensitivity Regulation using Systems Biology Approaches

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Over the past years, several long non-coding RNAs (lncRNAs) have been found to pro-actively regulate gene expression leading to cancer development. LncRNAs typically interact with coding genes (*via* mRNAs and proteins) to regulate gene expression and drug sensitivity in cancers. Despite distinct hallmarks, the exact mechanism of gene regulation common to pan-cancer systems is unclear. A systematic big-data analyses of global differential gene expression using UNC_IlluminaHiseq_RNAseqV2 data from The Cancer Genome Atlas (TCGA) in about 15 cancer types, utilizing 20,531 coding genes across each of the 5601 cancer samples (totaling a staggering 127,333,262 number of coding genes studied) and 25,154 lncRNA genes 2900 samples, respectively, as well as proteomics data from Human Protein Atlas were conducted. Further, using networks of these DEGs, we zeroed in on a recurrent pan-cancer lncRNA-mRNA (*PVT1-E2F1-FOXM1*) regulatory axis (1). This axis may play a key role across several cancer types, specifically in mRNA stability, splicing or degradation processes via *PVT1* lncRNA binding to key target genes. We are further investigating the structural basis of these interactions as well as mutational analyses alongwith *in vitro* analyses using siRNA knockdown and qPCR in our further attempts to understand these molecular interaction networks which may help elucidate how cancer develops. Tertiary structural interactions of RNPS1, one of our key target genes, with *MALAT1* lncRNA have also been carried out to gain an insight into their functional mechanisms (2). Towards our drug sensitivity/resistance analysis, using GDSC database, which contains approximately 2,12,774 drug dose–response measurements for drug sensitivity/resistance across 265 drugs and as many cancer cell lines, we have deduced a pan-cancer working model wherein EGR1 transcription factor may regulate *MALAT*1 transcription, which in turn may regulate *FN1* and *CD44*, two genes postulated to be playing a role in drug resistance in *NRAS*-mutant pan-cancer cell lines (3). These lines of comprehensive studies performed using systems biology approaches will be presented.

B-89. Machine Learning-Based QSAR in Designing of Novel/Repurposed Drug Candidates against Acid Ceramidase in Glioblastoma

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Acid ceramidase (ASAH1) has emerged as a promising therapeutic target in Glioblastoma multiforme (GBM) therapy. Inhibiting ASAH1 elevates the ceramide levels inducing apoptosis in GBM cells. Inhibitor carmofur's widespread clinical application is limited by its instability and toxicological concerns, thereby necessitating the search for alternative, more effective inhibitors. We employed an innovative and a comprehensive machine learning (ML)-QSAR approach to investigate the structural and pharmacological properties of carmofur and identify related bioactive ASAH1 inhibitors. Using an initial big dataset of 195 inhibitors and 431 3D descriptors, multiple algorithmic steps were implemented. Extra Trees Regressor model was found to be more robust, achieving higher predictive accuracy with R-squared value of 0.833 and an RMSE of 0.278. RDF20s, DPSA-1 and TDB2p features contributed more strongly. Molecular docking simulations revealed the bioactive conformation of carmofur and highlighted critical interactions of its electrophilic carbamoyl group involved in its covalent binding to ASAH1 residue Cys143. Virtual screening of structurally similar compounds identified 77 promising candidates, with N-hexylsalicylamide emerging as the top-most candidate upon comprehensive ADME/T profiling and retention of the key interactions with Cys143 (1). This integration of machine learning, molecular docking, and ADME/T profiling, presents a systematic framework adhering to all five OECD principles, for identifying and prioritizing potentially safer, more effective therapeutics, paving the way for advancements in precision medicine (2) in GBM therapy.

B-90. Variability in biologically active labdane diterpene and its isomer in Coleus forskohlii (Briq.) germplasm collected from natural locations of Western Himalayas, India

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Western Himalayas is globally important biodiversity hotspot for the conservation and cultivation of industrially important medicinal plants. In this context, 38 topographic spots were selected for the collection of *Coleus forskohlii* germplasms from Western Himalaya regions, having different geographical conditions. Simultaneous quantification of forskolin and iso-forskolin were performed using High performance thin layer chromatography (HPTLC). The obtained data revealed that there was significant variations in the level of forskolin and iso-forskolin in *C. forskohlii* accessions. UPGMA based clustering revealed that NBC-24 and NBC 72 were found to be rich source of forskolin and iso-forskolin respectively. In addition, analysis of variance shows that there is significant difference in Zn and Ni contents of soil among the samples ($p < 0.05$) and similar results were obtained in the case of P and K also. The aim of present study is to identify high metabolite yielding chemotype(s) and its correlation with existing nutrients presents in soil, to meet out the commercial demands. This study will also be helpful to promote the cultivation of this industrially important crop for societal upliftment in identified area as well as having similar phytogeographical locations.

B-91. Evaluation of the Protective Effects of Glycyrrhizin on UVB-Induced Testicular Oxidative Stress Associated with Hyperthyroidism

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Ultraviolet B (UVB) radiation exposure has been implicated in disrupting endocrine homeostasis, resulting in hyperthyroidism, a condition linked to compromised male fertility. This study aims to investigate the protective efficacy of glycyrrhizin, a principal bioactive compound derived from licorice root, against UVB-induced testicular dysfunction and oxidative stress. Given glycyrrhizin's well-documented antioxidant and anti-inflammatory properties, it is hypothesized to mitigate the deleterious effects associated with UVB exposure. The experimental design will utilize a rodent model wherein mice subjected to controlled UVB irradiation will serve to replicate hyperthyroidism-associated testicular damage. Comprehensive assessments of testicular function will be conducted, including evaluation of sperm parameters such as quality and motility. Concurrently, oxidative stress biomarkers, including malondialdehyde (MDA) levels and activities of key antioxidant enzymes—superoxide dismutase (SOD), catalase (CAT), and reduced glutathione (GSH)—will be quantified. Histopathological analyses of testicular tissue will further elucidate potential disruptions in spermatogenesis and alterations in the architecture of seminiferous tubules. A pivotal component of this investigation involves administering glycyrrhizin to a subset of UVB-exposed mice. Comparative analyses among control, UVB-exposed, and glycyrrhizin-treated groups will facilitate the determination of glycyrrhizin's capacity to attenuate oxidative stress and preserve testicular integrity. In summary, this research endeavors to elucidate the protective role of glycyrrhizin against UVB-induced testicular toxicity. By systematically evaluating its effectiveness in reducing oxidative damage and maintaining testicular function, the study aims to provide critical insights that may inform the development of therapeutic interventions to protect male reproductive health in contexts of UVB exposure. These findings may be particularly pertinent for individuals with occupational or therapeutic exposure to UVB radiation.

B-92. Melatonin alleviates chromium toxicity on PS II photochemistry and nitrogen metabolism in two paddy field cyanobacteria: an implication of nitric oxide

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In recent years, heavy metals (HMs) toxicity has become serious threats to metabolism of crops and beneficial microbes like cyanobacteria, an inhabitant of paddy field. Chromium (Cr), a toxic metal, at 120 µM concentration cause diminishing effects on growth, photosynthetic pigment (Chl a/Cars and PC/Chl a), PS II photochemistry (Fv/Fm, Fv/Fo, Psi_o, and DIo/RC) respiration and nitrogen metabolism [nitrate (NR and NiR) and ammonium (GS, GOGAT, and GDH) assimilating enzymes] in cyanobacteria, Nostoc muscorum ATCC 27893 and Anabaena sp. PCC7120. Melatonin (MT), a signalling molecule, at 0.8 µM when exogenously applied significantly ameliorated Cr toxicity on growth and supporting parameters in test cyanobacteria. Nitric oxide (NO), a gaseous signalling molecule, at 10 µM (SNP: donor of NO) was found to minimise Cr toxicity in both the cyanobacterial strains. Furthermore, to explore the crosstalk between MT and NO, biosynthetic inhibitor (LNAME; 200 µM) and scavenger (PTIO; 15 µM) of NO were applied. As a consequence of this, MT induced restoration on these parameters due to Cr toxicity was masked significantly. The finding suggest that MT induced resilient in test cyanobacteria against Cr toxicity and NO played prime role in mitigating the Cr toxicity by MT. The study also underscores that NO as SNP a cheapest chemical, may be used to provide an opportunity to endogenous MT for inducing the resistance among cyanobacteria (biofertilizer) against Cr toxicity that may support sustainable agriculture.

B-93. Ethylene and hydrogen sulfide mitigate chromium toxicity in two pulse crops by regulating sulfur assimilation, proline metabolism and oxidative stress markers

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In recent years Chromium, a toxic metal, has become tread to food security. Thus, constant scientific attempts have been taken for reducing chromium toxicity in plants. In light of this, we have explored potential of ethylene (25µM ethephon; donor) and hydrogen sulfide (10µM NaHS; donor) in alleviating hexavalent chromium [Cr (VI), 50 µM] stress in two pulse crops i.e. black bean and mung bean by estimating various physiological attributes. Cr(VI) declined shoot and root length in both pulse crops due to increased accumulation of oxidative stress biomarkers i.e. superoxide radicals (SOR), hydrogen peroxide (H_2O_2) and lipid peroxidation (as malondialdehyde, MDA equivalent), in spite of significant boosting in proline and cysteine contents. The addition of AVG (an inhibitor of ethylene biosynthesis) and PAG (an inhibitor of H_2S biosynthesis) further increased toxicity of Cr(VI) suggesting that their endogenous levels are important for tolerating Cr(VI) toxicity. Moreover, supplementation of either ET or H_2S alleviated Cr(VI) toxicity. Interestingly, ET did not rescue negative effects of Cr(VI) without endogenous h2S however, H2S potentially rescued negative effect of Cr(VI) even without endogenous ET. Overall, results indicate that ET and H_2S potentially down regulate Cr(VI) toxicity however, endogenous H_2S is requisite for ET action thereby, H_2S appears to be a downstream signal of ET in alleviating Cr(VI) stress in two pulse crops.

B-94. Regulatory role of hydrogen sulfide and brassinosteroid in tomato seedlings exposed to acetamiprid: Assessment of oxidative damage and antioxidant system

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The pesticides employed for pest management are assimilated by the plants, disrupting the metabolism and obstructing the growth of the plant, resulting in reduced agricultural productivity. In response to pesticide toxicity, plant growth regulators play a crucial role in sensing and inducing multiple signalling pathways that play a key role under stressful circumstances. Acetamiprid is a broad-spectrum insecticide whose residues have been found in crops like tomato, which are consumed as vegetables worldwide. Hence, the present work was undertaken to explore the ameliorative role of phytohormones, BRs and H_2S on the growth and physiology of tomato plants exposed to acetamiprid stress. Acetamiprid caused a reduction in overall growth and various biochemical parameters in tomato seedlings, which was evident by the reduction in fresh mass, root length and shoot length, reduction in photosynthetic pigment contents and lower rate of photosynthesis. There was also excessive accumulation of oxidative biomarkers (superoxide radical, hydrogen peroxide and lipid peroxidation) as a result of disturbed metabolism. However, on application of exogenous BR and NaHS (H_2S donor), an increase in fresh weight, plant growth, enhanced rate of photosynthesis and photosynthetic pigments was observed, which indicated that both signaling molecules BR and NaHS (H_2S donor) act in synchronisation to mitigate the acetamiprid toxicity.

B-95. Phytochemical Screening of Some Medicinal Plants of Rutaceae Family

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This study tested the leaves, fruits and stems of three medicinal plants (*Aegle marmelos*, *Feronia limonia*, and *Murrayakoenigii)* from the Rutaceae family, found in the Chitrakoot region. The plant parts were extracted using hot water and methanol. These extracts were then checked for different phyto-chemicals like carbohydrates, alkaloids, flavonoids, proteins, saponins, steroids, tannins, phenols, and terpenoids. The results showed that these plants contain many useful compounds that may help prevent chronic diseases.

B-96. A Novel Mechanism for Tauopathy in Progressive Multiple Sclerosis: Excitotoxic Misplacement of a Mitochondrial Anchor into Dendrites Driven by Tau-hyperphosphorylation

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On April 2nd, 2025, the FDA approved a Fast Track Designation for Biogen to use Antisense Oligonucleotides (ASO) to treat tauopathy in clinical trials for Alzheimer's Disease (AD) to meet an unmet medical need [1]. For Multiple Sclerosis (MS), there is a similar unmet medical need regarding tauopathy when MS transitions into the late, or Progressive MS that is currently incurable. AD and MS share commonality: there is comorbidity between AD and MS [2], and the recent awareness that progressive MS may be considered a secondary tauopathy [3]. This study lays the basic science foundation for a future repurposing of ASO tauopathy therapy from AD to MS. The central hypothesis is that in Progressive MS, tauopathy is not a passive bystander but an active contributor to synaptic degeneration through a novel toxic target known as DSI (Dendritic Syntaphilin Intrusion) discovered in our laboratory. In this hypothesis, the excitotoxic N-methyl-D-aspartate receptor (NMDAR) GluN2B activates Tau hyperphosphorylation (p-Tau), leading to the mislocalization or intrusion of a mitochondrial anchor SNPH into neuronal dendrites (DSI). This causes mitochondrial damage and subsequent synapse/dendrite disintegration. In support of this hypothesis that tauopathy is a key driver of DSI, we demonstrated using primary neuronal cultures that inhibitors of p-Tau kinases and Tau-KO both completely abolish DSI. We propose that a therapy for Progressive MS is repurpose the existing FDA-approved ASO Tau knockdown therapy from AD to treat MS.

B-97. Mechanistic Insights into Parkinson's Disease: The Interplay of α-Synuclein, Dnm1, and Actin in Mitochondrial Dysfunction

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Parkinson's disease (PD) is the second most common age-associated neurological disorder, which involves the misfolding and aggregation of α-synuclein, a presynaptic protein whose pathogenic mutations accelerate disease onset. Among these, the A53T variant of α-synuclein exhibits a stronger tendency to aggregate, contributing to neuronal dysfunction. To understand the effect of α-synuclein expression on mitochondrial homeostasis, we used the *Saccharomyces cerevisiae* strain expressing exogenous human *SNCA* as a model system. Our results demonstrate that expression of A53T α-synuclein leads to enhanced aggregate formation in wild-type (WT) yeast cells.

Mitochondrial fission in yeast is mainly carried out by the key GTPase protein named Dnm1, which functions in close coordination with the endoplasmic reticulum (ER) and actin cytoskeleton. Actin works in close association with mitochondria in maintaining the dynamics and recruitment of proteins. Deletion of *END3*, which is required for actin polymerization, led to mitochondria losing their normal reticular architecture, appearing instead as clumped structures. Furthermore, actin depolymerisation reduced α-synuclein aggregation. Together, these findings reveal that A53T α-synuclein exploits Dnm1 and actin to couple mitochondrial fragmentation, contributing mechanistic insight into PD pathology.

B-98. Role of mitochondria-peroxisome tether proteins in the pathogenesis of Parkinson's Disease

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α-Synuclein aggregation is a key pathological hallmark of Parkinson's disease, with the A53T mutant variant exhibiting enhanced cytotoxicity. Mitochondrial dysfunction is well-documented in PD, and disruption of membrane contact sites between mitochondria and other organelles may contribute to disease progression. In this study, we investigated the role of MCS between mitochondria and peroxisomes in the pathogenesis of the disease by expressing the A53T α-synuclein mutant. We focused on the tether proteins Fzo1, Pex34, Pex11, and Mdm34, which facilitate organelle interactions. Deletion strains lacking these tethers (*fzo1, pex34, pex11,* and *mdm34)* were constructed, and A53T α-synuclein was expressed in each. Our results revealed that α-synuclein expression severely impaired growth in *fzo1* cells and moderately reduced growth in *pex11* cells. Additionally, α-synuclein aggregation kinetics were altered, i.e aggregation was delayed in *fzo1* cells but increased in *pex34* cells compared to WT controls. These findings suggest that specific mitochondrial-peroxisomal MCS components influence α-synuclein toxicity and aggregation, contributing to PD pathology.

B-99. Organelle Architectural Remodelling in VPS35 Deletion Strain: Insights into the Mitochondria–Peroxisome–Vacuole Axis

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Vps35 is a core component of the retromer complex, recognized for its critical role in protein sorting and cellular homeostasis across eukaryotes. Recent research has revealed that Vps35 is also directly involved in regulating the formation and trafficking of mitochondrial-derived vesicles (MDVs), which are specialized transport carriers that bud from mitochondria and deliver selective cargo to peroxisomes and vacuoles. Despite growing recognition of this pathway, substantial research gaps remain. The molecular signals that regulate the trafficking routes of MDVs to vacuoles, peroxisomes, or other cellular destinations are not clearly understood, and the molecular specifics of how VPS35 identifies and chooses MDV cargo are not yet defined. To investigate these unexplored aspects, this study employs fluorescence microscopy–based morphometric analysis to examine the effects of VPS35 deletion on the morphology of these organelles. Peroxisome abundance was measured in glucose and oleic acid media, the latter of which stimulates peroxisome biogenesis, and mitochondrial morphology was compared under fermentative (glucose) and respiratory (glycerol) growth. These altered metabolic conditions enabled evaluation of the role of VPS35 in maintaining organelle architecture. The initial findings indicated although indicated unaltered mitochondrial morphology, an increased vacuolar perimeter and reduced peroxisomal content in the deletion strain.

B-100. Synthesis, Biological Evaluation and In-Silico Analysis Of Some Novel Nitrogen-Containing Heterocyclic Compounds

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Breast cancer is the most prevalent cancer in females, accounting for 40% of new cancer cases, making it the second leading cause of cancer deaths in female patients. There are several chemotherapeutical medications for the treatment of cancer. However, they are associated with some drawbacks like, toxicities, cancer resistance and adverse effects. In recent years, extensive research has been done in the field of Anti-cancer drug development. Since indole nucleus has shown quite good response as an anticancer agent, hence this nucleus has become an interest in the field of research. Vinca plants contain indole, which has anti-cancer properties. In light of this, indole has been investigated as a potential lead in cancer treatment. In the present research work, we have performed density function theory, *in-silico* investigations and synthesized our final product in three steps *via* Michael addition reaction between indole and chalcone derivatives via ZnO nano-catalyst using ultrasonic irradiation. On the basis of computational and experimental analysis we got the rationalized results. Molecular docking score -7.7 to -8.9 kcal/mol, which is precious to predict the binding affinity of molecules to a protein or receptor. These compounds are also subjected to breast cancer cell line (MCF-7) and exhibited the overall very good activity at 10-35 µM. The present research on indole-chalcone derivatives, by using molecular docking, density function theory investigations, pharmacokinetics and drug-likeness studies (ADMET), anticancer activity results, utilized the aim of the good anticancer compound have been synthesized for the possible treatment of Breast carcinoma.

B-101. Phytofabrication of copper oxide nanoparticles and their antifungal activity against plant pathogenic fungi

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Agriculture is the economic backbone of most developing nations. The employment of conventional agrochemicals has supported the development of a rapidly growing global population. However, the overuse of these agrochemicals results in damage to approximately one-third of crops, primarily due to outbreaks caused by microbial and pest attacks, natural disasters, reduced nutrient availability, and poor soil quality. In the last decades, the development of eco-benign nanomaterials using plant-based approaches has emerged as a promising strategy in sustainable agriculture and plant disease management. Since its use in ancient civilizations, copper has been utilized as an antimicrobial agent and is now being added to commercial fungicides. The present study reports the phytofabrication of copper oxide nanoparticles (CuO-NPs) by using aqueous leaf extract of *Mansoa alliacea*. The green fabricated CuO-NPs were characterized through UV–vis spectroscopy, FTIR, XRD, SEM, and TEM analysis. SEM and TEM analysis indicates that green CuO-NPs are spherical in shape with size ranging from 10 to 50 nm. The antifungal activity of synthesized CuO NPs was tested against three plant pathogenic fungi, *Fusarium oxysporum* f.sp. *lycopersici*, *Alternaria solani,* and *Helminthosporium sativum,* using the agar well diffusion method. The green CuO-NPs exhibit significant antifungal activity against all tested fungal pathogens and can serve as a sustainable, cost-effective, and eco-friendly alternative to synthetic fungicides.

B-102. Eco-behavioral and conservation of highly provisioned focal troops of Rhesus macaque and Hanuman Langur from some habitats of Satna district of Madhya Pradesh

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The rhesus macaque (*Macaca mulatta*) and Hanuman langur (*Semnopithicus entellus*) are one of the well known non-human primate species of old world monkeys. Satna district of Madhya Pradesh is a pilgrimage place as well as an industrial place with a number of cement industries. Maihar is a pilgrim centre of National importance for its temple of Maa Sharda, whereas Chitrakoot is ancient, religious and spiritual place of India with much of its historical background. Field observations were carried on some focal troops of rhesus macaque living in Chitrakoot Kamatnath parikrma area, Kardmeshwer dham hill area and Maihar Sharda Ma temple area. All three study sites having hill area with largest forest habitat. The artificial feeding of Rhesus macaque in these areas usually leads to change in behavioural strategies, individual activity and physical growth rate etc. The variability in the frequency of provisioning directly affects the ranging of particular troop. Troops showed a well marked home range with certain degree of defense mechanism. During the present investigation data on group size, sex ratio and home ranges were obtained and correlated with each other. The present paper suggests recommendations to improve the present situation of Rhesus macaque (*Macaca mulatta*) and Hanuman langur (*Semnopithicus entellus*), their eco-behavioral and conservation in different location of pilgrimage places of Satna M.P.

B-103. Eugenol loaded Chitosan Nanoparticles in Allergic Airway Inflammation: Metabolomic Profiling and Pathway Regulation of N-kB p65 and HDACT through ln Vivo and In Silico Approaches

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Eugenol, the principal bioactive compound from Syzygiim aromaticum L., is recognized for its strong anti-inflammatory effects and has been reported in numerous pharmacological studies to reduce asthma-induced inflammation. The present study aims to improve the thermal stability and therapeutic effectiveness of eugenol by encapsulating it within chitosan nanoparticles. Eugenol was encapsulated in chitosan nanoparticles using ionic gelation, and formulation parameters were refined through the Design of Experiment (DoE) approach to enhance its stability and delivery. The synthesized eugenol-chitosan nanoparticles, sized 50 to 200 nm, demonstrated superior dispersibility, which is a result of electrostatic and hydrogen bonding between eugenol molecules and the chitosan matrix. Enhanced dispersibility observed via SEM and TEM analyses implies a higher potential for bioavailability and therapeutic benefit in respiratory disease treatment. An allergic asthma phenotype was induced in Balb/c mice by sensitizing and challenging them with ovalbumin (OVA). A dose ofEUGCNP(10 mg/kg) was administered to evaluate its effects on NF KBp65 and HDACI signaling pathways. Immunofluorescence and hematoxylin and eosin (H&E) staining techniques were used to examine inflammatory alterations. Analysis of metabolites in BALF and lung tissues identified alterations linked to EUGCNP administration. Pro inflammatory cytokines (|L-13, IL-4, IL-S, and TNF-a) were measured by ELISA, while molecular docking and molecular dynamics simulations elucidated EUGCNP's interactions with key regulatory targets. Treatment with EUGCNP significantly lowered the increased expression of NF-kBp65 and HDACI seen in the asthma group, suggesting its effectiveness in mitigating airway inflammation.

B-104. Oxidative Stress-Induced α-Synuclein Acetylation Promotes Neurodegeneration in a Mouse Model of Post-Traumatic Parkinsonism

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Traumatic brain injury (TBI) is associated with an increased risk of Parkinsonism, although the underlying mechanisms remain unclear. A key mechanism involves TBI-induced oxidative stress, which may modify proteins such as α-synuclein through acetylation, promoting aggregation and dopaminergic neuron loss. To investigate this hypothesis, we developed a combinatorial mouse model combining repetitive mild TBI (rmTBI) with MPTP exposure. Adult Swiss albino mice underwent rmTBI, MPTP treatment, and rmTBI + MPTP combination. Motor performance was evaluated using rotarod and hanging wire assays. Oxidative stress markers and antioxidant enzyme activity were assessed. Protein expression of α-synuclein, tyrosine hydroxylase, and inflammatory markers was analyzed by western blotting, and dopaminergic neurons in the substantia nigra pars compacta were examined using immunohistochemistry. Acetylation of α-synuclein was assessed through co-immunoprecipitation with an acetyl-lysine antibody. Mice subjected to rmTBI or MPTP individually had mild motor alterations, but the rmTBI + MPTP cohort demonstrated the most pronounced abnormalities. Oxidative stress markers, including lipid peroxidation (LPO), were elevated, while the antioxidant enzyme activity (SOD) was reduced. Western blotting reveals the rmTBI + MPTP group exhibited the strongest pathological changes, with increased α-synuclein accumulation and dysregulation of inflammatory proteins. Immunohistochemistry confirmed significant dopaminergic neuronal degeneration, while co-immunoprecipitation revealed acetylated α-synuclein, establishing a link between oxidative stress and pathogenic protein modification. These findings suggest rmTBI exacerbates MPTP-induced Parkinsonism via oxidative stress, inflammation, and α-synuclein acetylation.

B-105. Ayurvedic formulation of kachnar (Bauhinia variegata)-Derived Hemocompatible Gold, Silver and Bimetallic Nanozymes: A Synergistic Approach for Targeting Oxidative Stress in Brain Cancer

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Glioblastoma is characterized by elevated oxidative stress, which promotes tumor progression and therapeutic resistance. This study presents a sustainable and biocompatible approach for synthesizing gold (Au), silver (Ag), and bimetallic (Au–Ag) nanoparticles using *Bauhinia variegata* (Kachnar Powder), an Ayurvedic formulation, to target glioblastoma. The phytochemicals in Kachnar Powder act as both reducing and stabilizing agents, enabling precise control over nanoparticle size, morphology, and surface properties. The resulting spherical, negatively charged nanoparticles exhibit pH-responsive multi-enzyme mimetic activities demonstrating peroxidase-like activity under acidic conditions and enhanced catalase- and superoxide dismutase-like activity at neutral pH-mimicking the differential microenvironments of tumor and healthy tissues.

The nanozymes show excellent hemocompatibility and efficient blood-brain barrier (BBB) penetration, critical for central nervous system targeting. In vitro studies using human glioblastoma (LN229), human peripheral blood mononuclear cells (hPBMCs), and human embryonic kidney (HEK293) cells reveal a dual regulatory role: selective generation of reactive oxygen species (ROS) in cancer cells leading to oxidative damage, while simultaneously reducing intracellular ROS levels in non-malignant cells. This selective ROS modulation underscores the therapeutic potential of the nanoparticles in inducing cancer cell-specific toxicity without harming healthy tissue.

The pH-dependent enzymatic behaviour aligns with the acidic tumor microenvironment and physiological conditions of normal cells, enabling context-specific activity. By integrating Ayurvedic medicine with nanozyme technology, this work proposes a novel strategy for targeted glioblastoma therapy using multi-enzyme mimetic, plant-derived nanoparticles with inherent biocompatibility and BBB-crossing ability.

B-106. From Cosmetics to Neurotoxicity: Investigating Diethyl Phthalate and the Amelioration Action of Genistein

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Neurodegeneration is a harmful process marked by the progressive loss of neuronal structure and function, leading to impaired transmission of chemical and electrical signals in the brain. This disruption is central to the development of serious neurological disorders such as Alzheimer's disease, Parkinson's disease, Huntington's disease, and Amyotrophic Lateral Sclerosis (ALS). Recent studies have identified Diethyl Phthalate (DEP) as a chemical commonly found in cosmetics, plastics, and personal hygiene products, as a potential contributor to neurodegenerative damage. Human exposure to DEP occurs through ingestion, inhalation, or skin contact. Once inside the body, DEP can induce oxidative stress by elevating levels of reactive oxygen species (ROS), which in turn leads to lipid peroxidation and compromises mitochondrial membrane integrity, both of which are critical to neuronal survival. To investigate these effects, zebrafish (*Danio rerio*) were used as a model organism. Following acclimatization, the fish were exposed to DEP, and a series of behavioral and biochemical assays were conducted to assess neurotoxicity.

In an effort to counteract DEP-induced damage, genistein, a soy-derived isoflavone with potent antioxidant and anti-inflammatory properties, was administered. Genistein plays a multifaceted neuroprotective role: it scavenges ROS, enhances endogenous antioxidant enzyme activity, stabilizes mitochondrial membranes, and suppresses pro-inflammatory signaling pathways. These actions collectively help restore neuronal integrity and function, making genistein a promising candidate for mitigating environmental neurotoxicity. While these findings highlight genistein's therapeutic potential, further research is needed to elucidate the underlying molecular pathways and explore its broader implications for human health.

B-107. Probing pathogenic nucleic acid motifs using functionalized nucleoside toolbox

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Numerous biophysical tools have provided efficient systems to study nucleic acids. However, our current understanding on how nucleic acid structure complements its function, particularly in cellular environment, is limited. This general limitation is largely due to the lack of probes that can be used in both cell-free and cellular assays, and in more than one biophysical technique. In this context, moving away from the tradition approach of "one label one technique" we adopted an innovative approach to investigate the nucleic acid structure and function in cell-free and cellular environments by using conformation-sensitive multifunctional nucleoside analog probes. Based on this strategy, we develop nucleoside analogs equipped with two or more labels (eg., fluorophore, ^{19}F NMR isotope label and X-ray crystallography phasing atom), which serve as common probes for analyzing nucleic acid motifs simultaneously by using a combination of fluorescence, NMR and X-ray crystallography techniques.[1-3] In this presentation, I will discuss the utility of our nucleoside probes in dissecting the structural polymorphism of G-quadruplexes formed by human oncogene promoters and HIV-1 long terminal repeat (LTR) implicated in viral propagation and latency.[4-6] Structural analysis and ligand binding properties in *in vitro* and in cell models by using fluorescence and ^{19}F NMR techniques will be presented.

B-108. Genotyping of the Growth Hormone Gene in Jakharana Goats Using HRM Analysis

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The growth hormone (GH) gene plays a crucial role in regulating growth, reproduction, metabolism, and milk production, thereby influencing overall performance and productivity. In the present study, 40 blood samples were collected from the Jakharana goat, a native Indian dairy breed from Rajasthan known for its high milk yield, adaptability to arid conditions, and distinctive black coat with white markings.Genomic DNA was extracted from the samples, and its purity and quality were assessed using a Biophotometer, with OD (260/280) ratios ranging between 1.7 and 1.8, indicating good-quality DNA. Further confirmation through 1% agarose gel electrophoresis showed intact DNA bands without degradation. A 140 bp fragment of the GH gene was optimized using gradient PCR and successfully amplified by conventional PCR, ensuring sufficient target DNA for genotyping.Genotyping was carried out using High-Resolution Melting (HRM) analysis, which identified two genotypes among the samples. HRM is regarded as a gold standard technique for detecting genetic variation, as it enables precise identification of mutations and single nucleotide polymorphisms (SNPs) even in small DNA fragments with high sensitivity and accuracy. The genotype distribution was 55% for Blue (AA) and 45% for Red (AB). These findings reveal genetic variability in the GH gene of Jakharana goats and underscore the importance of HRM as a robust tool for molecular characterization. Such insights are valuable for selective breeding programs aimed at improving growth performance, adaptability, and productivity in this important dairy breed.

B-109. Role of Homoeopathic medicine in management of Spermatorrhoea – An Observational case study

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Spermatorrhoea is a condition characterized by involuntary seminal emissions without copulation, classified under culture-bound syndromes and neurotic disorders. It commonly affects young, recently married males from conservative and lower socio-economic backgrounds. The condition is associated with psychological stress, lifestyle factors, and physical ailments such as erectile dysfunction and prostatitis. This study aims to identify effective homoeopathic medicines and explore management strategies for spermatorrhoea. A prospective observational case study was conducted on 20 patients from the State Homoeopathic Medical College & Hospital, Ghazipur. Remedies were selected based on the totality of symptoms, and treatment outcomes were categorized by the extent of improvement. The study emphasizes the role of homoeopathy in enhancing sperm quality and addressing psychological factors. Lifestyle modifications, diet control, and avoidance of stimulants were part of the management. Homoeopathy offers a holistic, cost-effective, and safer approach for treating spermatorrhoea. The findings support its potential in improving male reproductive health.

B-110. Unique Topography of The Avian Arcopallium associated with Sophisticated Behaviour

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The avian arcopallium a critical component of the forebrain, plays a crucial role in modulating complex and sophisticated behaviors such as aggression, fear, and vocalization, which receives inputs from numerous brain areas and is a major source of descending sensory and motor projections. The arcopallium is also considered the avian homologue of mammalian deep cortical layers or amygdalar subdivisions. This brain region comprises several subdivisions, but the internal organization of the arcopallium is not well understood. This study using Golgi and Nissl staining methods have provided detailed insights into the structural and functional attributes of the chick brain on the basis of morphological and anatomical characterization of neuronal subtypes present in different subregions of the arcopallium which is significant to advanced our understanding in Behavioral and evolutionary neuroscience. This overview on the chick brain arcopallium and its comparison provide perceptions into the similarities and differences in cortical and amygdalar regions of birds and mammals. Each cell type in arcopallium is associated with specific behavioral functions and advanced our understanding of how specific neuronal subtypes contribute to the modulation of behavior and underscores the complexity of the arcopallium role in behavioral regulation.

B-111. Decoding Neuroprotection: A Translating Journey from phytochemical-based effective therapies for Neurodegeneration

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Advancing age naturally brings about a decline in cognitive abilities, and it remains the strongest risk factor for developing neurodegenerative diseases. Both cognitive decline and neurodegenerative diseases pose serious challenges to independence and overall quality of life in older adults. Neurodegenerative disorders (NDs) such as Parkinson's disease (PD), Alzheimer's disease (AD), Huntington's disease (HD), multiple sclerosis (MS), and epilepsy are among the most prevalent conditions affecting the central nervous system (CNS). These disorders occur with some antiepileptic drugs, that are characterized by progressive damage that leads to significant clinical manifestations and biochemical alterations. A central feature of their pathology is the abnormal accumulation of misfolded proteins, for instance, amyloid-β and tau in AD, and α-synuclein in PD. Despite ongoing advances, there are currently no curative therapies for most NDs, and available treatments are largely limited to symptom management or slowing disease progression, emphasizing the urgent need for innovative therapeutic approaches. Natural compounds, particularly polyphenols and other bioactive molecules, have emerged as promising candidates for neuroprotection.

This study aims to explore and understand the therapeutic role of flavonoids. alkaloids, terpenoids, and extracts from plants, including *seabuckthorn* (Hippophae rhamnoides) and Aparajita (Clitoria ternatea). These agents exert diverse biological effects, including antioxidant and anti-inflammatory actions, as well as inhibiting toxic protein aggregation, stabilizing mitochondrial function, modulating cellular signaling, chelating metal ions, and enhancing cognitive processes. Robust preclinical evidence supports these properties, highlighting their therapeutic promise in the prevention and management of neurodegenerative diseases.

B-112. Avian Pallium for Understanding Neuronal Correlates of Cognition in Bird Brain

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Our understanding of avian brain and cognition has undergone a revolution in the last two decades. The unexpected revelation of birds amazing cognitive capacities sparked research in the avian pallium. The hodological, cellular, embryological, and developmental genetic stages of the pallial territories of birds and mammals seem to share a high degree of homological correlation, despite their evolutionary separation. In mammals, the pallium which is essential component of telencephalon—is mainly composed of layered structures like the isocortex, but in birds, it is primarily composed of a collection of nuclei. The aim of this study is to examine the pallial cell types and circuitry in the avian brain that underpins sophisticated cognitive processes. To visualize and describe the morphological diversity of the precise shape and morphology of individual neurons linked to cognition, silver impregnation is used. Distinct neuronal types were identified in bird pallium similar to mammals, which provides valuable insights into structure and function of avian brain regions responsible for cognition in birds. Our comparative investigation demonstrates how functional specialization of neurons in various brain regions underpins neuronal morphology. These results provide a structural basis of avian cognition and open new directions for integrative translational models in neuroscience.

B-113. Saponin extraction from fenugreek seed: A practical study on its antioxidant and antimicrobial properties

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Fenugreek (Trigonella foenum-graecum L.) is a well-known medicinal plant valued for its pharmacological properties and high content of bioactive compounds, particularly saponins. The present study was undertaken to extract saponins from fenugreek seeds and to evaluate their antioxidant and antimicrobial potential through practical laboratory analyses. Saponins were extracted using an ethanol–water solvent system followed by liquid–liquid partitioning to obtain purified fraction. The presence of saponins was confirmed through characteristic frothing and hemolytic tests, as well as phytochemical screening. The antioxidant capacity of the extract was determined using the DPPH radical scavenging assay and the total antioxidant capacity method. Results demonstrated a dose-dependent increase in free radical scavenging activity, indicating strong antioxidant potential comparable to standard ascorbic acid. Antimicrobial activity was assessed against selected pathogenic microorganisms, including Staphylococcus aureus, Escherichia coli, and Candida albicans, using the agar well diffusion method. The saponin extract exhibited noticeable inhibitory zones against both Gram-positive and Gram-negative bacteria, as well as moderate antifungal activity, confirming its broad-spectrum efficacy. Overall, the findings suggest that saponins derived from fenugreek seeds possess potent antioxidant and antimicrobial activities, attributable to their amphiphilic and membrane-active nature. These results highlight the potential of fenugreek saponins as natural bioactive agents that could serve as alternatives to synthetic antioxidants and antimicrobial drugs. The study supports the traditional use of fenugreek in herbal medicine and emphasizes its possible applications in the development of pharmaceutical, nutraceutical, and food-preservation products.

B-114. Unraveling the Molecular Mechanisms of Bacopa monnieri's Neuroprotective Effects in Hypothyroidism-Induced Neurodegeneration

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Cypermethrin (CYP) is a commonly used type II Pyrethroid. This pesticide tends to accumulate in various body tissues, causing organ dysfunction. It is the major endocrine disruptor worldwide. The current study aims to investigate how CYP-induced hypothyroidism leads to neurodegeneration and cognitive impairment in albino mice. The experiment was divided into four groups. The control group (CN) was given water and a regular diet without restriction, while the CYP and CYP+BM groups were administered 15 mg/kg bw of cypermethrin orally by gavage. The BM group was administered 200 mg/kg bw of Bacopa monnieri, while the CYP+BM group received co-administration of BM for 28 days. The findings revealed that substantial changes in the hormone levels (drop in T3 and T4 and rise in TSH), Neurotransmitters, and behaviour were produced by the CYP-induced hypothyroidism group. The antioxidant enzymes SOD, CAT, and GPx were also significantly reduced, while the level of oxidative markers (LPO, AOPP, and H2O2) increased concurrently. On the other hand, neurodegeneration and behavioural dysfunction are impacted by the substantial decline in THR-a receptor expression. Neurodegenerative changes, such as alterations in the expression of NeuN, Cas 3, and PARP-associated proteins in neurodegeneration and oxidative stress, can be seen. In comparison, BM co-administration can phytoremediate CYP-induced hypothyroidism and its associated consequences. Furthermore, additional research is needed in the future to determine the association between hypothyroidism and neurodegenerative diseases, as well as the underlying mechanisms. To reduce morbidity and mortality, thyroid function tests should be performed regularly in all patients with brain disease.

B-115. A potential intervention to the Dialysis-related amyloidosis (DRA) using peptidomimetic-based strategy

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Dialysis-related amyloidosis (DRA) is an unavoidable complication of long-term renal failure, marked by β2-microglobulin (β2m) amyloid accumulation in bones and joints during prolonged hemodialysis. Current therapies are limited by high cost and poor specificity. Here, we present a peptidomimetic-based strategy using a nontoxic, core-modified bispidine analogue, $B(LVI)_2$, which effectively inhibits acid-induced fibrillation of human β2m (Hβ2m). Our experimental findings reveal that $B(LVI)_2$ prolongs the aggregation lag phase and reduces fibril formation in a dose-dependent manner. The compound redirects Hβ2m fibrillation toward noncytotoxic, morphologically distinct intermediates. Overall, $B(LVI)_2$ exhibits strong antifibrillation activity, highlighting its potential as a lead molecule for developing new therapeutics against DRA.

B-116. Cell loss in aged human peripheral retina: role of apoptosis

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The aging human retina shows significant loss of photoreceptor cells over its central to peripheral gradient. Photoreceptor cell death (PCD) is common in diseases, and in animal models after acute exposure to artificial light. However, mechanisms of human PCD with aging are not clear, though apoptosis is often attributed to this process. This paper shows that apoptosis is common in aged human retina (donor age: 81-89 years, N=4), especially in the nasal peripheral quadrant. The eyes were obtained within 3-4 hours of death and fixed in 4% paraformladehyde (right eyes) and modified Karnovsky's fixative (left eyes). Sections from the right eye were processed for TUNEL (a marker of apoptosis). The retina of the left eye was processed for light and transmission electron microscopy (TEM). It was seen that few nuclei in the outer nuclear layer (ONL) were TUNEL positive. There were signs of apoptosis in ONL, the nuclei were at different phases of chromatin condensation and shrinkage, which differed from normal euchromatin containing nuclei in situ. TEM revealed many dead cells in the peripheral retina, but relatively few in the macula, suggesting a differential mechanism of PCD might operate in the retina. These data indicate that the human peripheral photoreceptor cells die via apoptosis, which continues till late aging. Cone loss is slow and this provides an opening of reversing changes before their death.

B-117. Impact of chlorpyrifos on photosynthesis and oxidative stress in brinjal seedlings: Implication of signalling molecules GABA and NO on toxicity amelioration

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Pesticide usage is considered one of the tools for green revolution, however injudicious application has become threat to food security and human health. Phytohormone /signalling molecule being potent regulator may ensure the food productivity and quality. In this study, the potential role of two signalling molecules gamma-aminobutyric acid (GABA) and nitric oxide (NO) was explored in mitigating chlorpyrifos, an insecticide, induced toxicity in brinjal seedlings. Chlorpyrifos exposure diminished seedling growth by impairing photosynthesis (pigments, PS II photochemistry and gas exchange parameters) and also by inducing oxidative stress (raised stress biomarkers SOR, H_2O_2 and MDA equivalent contents) despite accelerated activity of antioxidant enzymes CAT, SOD, POD and GST. Exogenous GABA and NO addition significantly lowered down oxidative stress biomarkers as consequence of further augumentation in antioxidant enzyme activities. As a result the strengthening effects on PS II photochemistry and gas exchange parameters, finally improved the seedling growth performance even under chlorpyrifos stress. The alleviating role of GABA and NO was further confirmed by the use of biosynthetic inhibitors, L-NAME (for NO) and MPA (for GABA), where chlorpyrifos further raised the oxidative stress induced damage, and impaired the photosynthesis, thereby declined the seedling growth. The study concludes that GABA and NO individually confer tolerance to chlorpyrifos toxicity, and together they provide more effective protective mechanism as evident by markedly alleviating the adverse effects of chlorpyrifos on brinjal seedlings. Hence, the two signalling molecules may be considered as better option for sustainable agriculture even in pesticide contaminated crop fields.

B-118. Utilization Of Aloe Vera (Aloe Barbadensis Miller) Extract As A Natural Growth Enhancer In A Potato (Solanum Tuberosum) Tissue Culture

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This study investigates the utilization of Aloe vera (*Aloe barbadensis Miller*) leaf extract as a natural growth enhancer in potato (*Solanum tuberosum*) tissue culture. The research aimed to evaluate the efficacy of Aloe vera extract in promoting shoot multiplication and overall plant growth, comparing it with conventional synthetic plant growth regulators (BAP and NAA) and a basal MS medium control. Results demonstrated that MS medium supplemented with 5–10% (v/v) Aloe vera extract significantly enhanced shoot elongation, achieving lengths of 2.0 cm and 5.4 cm after 7 and 14 days, respectively—outperforming both synthetic hormones and the control. The natural growth-promoting compounds in Aloe vera, including auxins, cytokinins, polysaccharides, and antioxidants, contributed to sustained explant development and reduced oxidative stress. In contrast, synthetic hormones showed initial effectiveness but plateaued over time. The study successfully developed an eco-friendly, cost-effective micropropagation protocol using Aloe vera extract, with all regenerated plantlets acclimatizing successfully. These findings highlight Aloe vera as a promising organic alternative to synthetic PGRs for sustainable large-scale potato propagation.

B-119. A computational analysis of inertial drag on an MHD, blood-based flow of a ternary nanofluid over a stretching disk under slip conditions

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This research represents an innovative theoretical model of a ternary nanofluid consisting of Cu, Ag, and CuO nanoparticles suspended in blood passed over a stretching disk, which illustrates admirable properties of thermal conductivity to accelerate the thermal transport phenomenon in fluids. The analysis explores the complex interplay between several factors, including a heat source which is non-uniform, electromagnetic effects, ohmic heating, and the impacts of a porous medium. However, the primary focus of the proposed investigation is the application of the velocity slip condition to escalate the thermophysical model. The complex PDEs for energy and flow are reduced into the nonlinear ODEs with the help of suitable similarity transformations. The 4 th order Runge-Kutta method, coupled with the shooting mechanism applied to solve the specified set of ODEs. The extensive analysis of the graphs and tables vividly demonstrates the impacts of the parameters on the energy and velocity outlines, alongside with the skin friction and the Nusselt number. Moreover, an ANN model is employed to predict the Nusselt number. The findings indicate that the rate of heat transfer exhibits significant enhancements in ternary nanofluid flow in the presence of heat sources and electromagnetic effects. These results offer promising implications for advancing drug delivery and MRI techniques throughout the body.

B-120. Investigation on the Physiological Effects of Meditation employing a Network Medicine approach

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Understanding the systemic impact of meditation has evolved through numerous clinical and molecular studies that collectively suggest the beneficial changes in cardiovascular, metabolic, inflammatory, and cognitive domains. This work uses a meta-analytic approach to synthesize data from previously reported meditation studies, integrating results from proteomics, biochemical markers, and clinical assessments. Comprehensive pathway enrichment and network analyses are carried out on the aggregate set of differentially expressed proteins and biomarkers identified across multiple published works. The analyses uncovered significant enrichment in pathways linked to stress regulation (including cortisol reduction and DHEA elevation), energy metabolism (upregulation of glycolytic enzymes such as GAPDH, PGK1, and ENOA), and immune/inflammatory modulation (decreased CRP, TNF-alpha, IL-6, and NF-kappaB, alongside increased IL-4). Network construction identified topologically central proteins mediating lipid metabolism and immune cell activation, suggesting that meditation yields coordinated changes across molecular networks relevant to cardiovascular resilience and neuroprotection. This meta-analysis advances the mechanistic evidence supporting meditation, physiological benefits and allows refined mapping of disease-relevant molecular modules, providing a systems biology framework for future therapeutic explorations and personalized interventions.

B-121. Geographical distribution of Soil of Sandila & bharawanb block of district hardoi, U.P.

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The survey works on soil characteristics of the block Sandila and Bhrawan were carried out during election duty 2023 to 2024 with vikshit bharat sankalp yatra The major mandatory activity of KVKs are OFTs, FLDs and trainings soil testing laboratory is neglected due to unavailability of any funds from any sources myself collected soil samples from farmers fields in 2021-2024 in the month of January to December we can say "Jethkidupahari" maximum samples were analysed by me in my laboratory at Krishi Vigyan Kendra (ICAR-CSSRI), Hardoi, (U.P.) or in thatch. According to the results the soil status of the block Sandila & Bharawan are good soil health to very poor soil health. The major problem of Sandila & bharawan are soil salinity, sodicity, soil digging, undulated topography, water stagnation in the district is also problematic. Physically soil texture is clay loam to sandy loam soil fertility status regarding major and micronutrients very low to high in the both blocks and in case of biological properties excellent to very poor population of earthworms and fungi were recorded due to energy source in soil is organic carbon and salinity. Soil colour varried from whitish to grey measured by Munsell colour soil chart. Soil health cards regarding information given among farmers among farmers on the occassion of World Soil Day 5th December since 2021 t0 2023 by KVK Hardoi-II.

B-122. Comparative study between three Krishi Vigyan Kendra (KVK) Jurisdiction soil status

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At present there are 731 out of which 66 under ICAR Institute the major mandatory activity of KVKs are OFTs, FLDs and trainings soil testing laboratory is neglected due to unavailability of any funds from any sources in my opinion if available soil testing kit from 2015 are only myth myself taken soil samples from farmers fields from 2009-2025 maximum samples were analysed by me in my laboratory at KVK Kushinagar and by feel methods with farmers but some samples brings to state departments of agriculture & at ICAR-CSSRI-RRS Lucknow. According to the results of the soil status of KVK, Kushinagar is medium but status of Bhadohi is low and Hardoi – II is very low in maximum properties of the soils. The major problem of Kushinagar is waterlogging due to river budhi gandak and in Bhadohi/Hardoi-II is salinity and alkalinity all district are physically clay loam to sandy loam soil fertility status regarding major and micronutrients low to high in all three districts and in case of biological properties Kushinagar ranks first.

B-123. Pyridoxine Powerhouse: Co-Expression of PDX1.3 and PDX2 Enhances Vitamin B6 Biosynthesis and Stress Resilience in Potato (Solanum tuberosum L) through Metabolic Engineering

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Vitamin B6 is an essential micronutrient that humans cannot synthesize internally and must obtain from dietary sources, particularly plants and plant-based foods. As a staple crop consumed worldwide, potato (*Solanum tuberosum* L.) represents an ideal target for biofortification strategies to alleviate vitamin B6 deficiencies. In the present study, we sought to enhance both vitamin B6 accumulation and stress tolerance in potato using a genetic engineering approach. Co-expression of the *PDX1.3* gene from *Brassica napus* and the *PDX2* gene from *Arabidopsis thaliana* was achieved through Agrobacterium-mediated transformation. Biochemical assays demonstrated a significant rise in vitamin B6 content within the transgenic tubers, showing increases of 107% to 205% compared to the wild type. Moreover, transformed lines exhibited superior tolerance to salinity stress under NaCl treatment. Spectrophotometric analyses of antioxidant enzymes—ascorbate peroxidase (APX), catalase (CAT), superoxide dismutase (SOD), and dehydroascorbate reductase (DHAR)—revealed notably elevated activities in the engineered lines. Collectively, these findings indicate that co-expression of *PDX1.3* and *PDX2* in potato simultaneously boosts vitamin B6 biosynthesis and enhances abiotic stress resilience. This combined improvement highlights the potential for developing potato cultivars that are both nutritionally enriched and better adapted to environmental stresses, thereby addressing global health and agricultural challenges.

B-124. Advancements in Neuroimaging for enhanced Diagnosis and Therapeutic management of Neurological Diseases

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This review explores the integration of advanced neuroimaging technologies with deep learning approaches for the diagnosis and management of neurological disorders. The growing prevalence of neurodegenerative diseases such as Alzheimer's and Parkinson's have created a pressing need for early and precise diagnostic tools. Recent advancement in neuroimaging modalities such as functional magnetic resonance imaging (fMRI), positron emission tomography (PET) scans, and high-resolution MRI has provided unprecedented insight into brain anatomy and function. Simultaneously, the development of deep learning algorithms, including convolutional neural networks (CNNs), recurrent neural networks (RNNs), and generative adversarial networks (GANs), has significantly enhanced the analysis and interpretation of large and complex neuroimaging datasets. We emphasize that the incorporation of these technologies enhances diagnostic precision, efficiency, and monitoring disease progression, enabling more precise and personalized treatment approaches. It also emphasizes the potential of machine learning-driven neuroimaging to transform interventions. Ultimately, the review demonstrates that the convergence of neuroimaging and deep learning represents a significant advancement in clinical neuroscience, offering promising avenues for improving diagnostic consequences, personalized medicine, and real-time management of neurological diseases.

B-125. Behavioural Ecology and Its Implications for Wildlife Survival and Adaptation

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Behavioural ecology explores how animal behaviour evolves and functions in response to ecological pressures, influencing survival, reproduction, and overall fitness. By examining feeding strategies, communication, social interactions, mating systems, and predator–prey dynamics, behavioural ecology provides insights into how species adapt to changing environments. Understanding these behavioural mechanisms helps explain variation in species distribution, population stability, and ecological balance. Moreover, such knowledge plays a crucial role in wildlife conservation, as behavioural insights guide the design of effective management plans, habitat restoration efforts, and conflict mitigation strategies. Integrating behavioural studies with conservation biology enhances our ability to predict responses of wildlife to environmental changes and anthropogenic disturbances, ultimately supporting the long-term survival and adaptation of species in the wild.

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