INTERNATIONAL CONFERENCE ON
ENVIRONMENTAL HEALTH AND RESILIENCE

ICEHR - 2026

CONFERENCE GUIDE

Jointly Organised by

Human Resource Development Centre (HRDC)
SCOTT CHRISTIAN COLLEGE (AUTONOMOUS) NAGERCOIL, TAMIL NADU, INDIA

UNIVERSITY OF JAFFNA, SRI LANKA

MANONMANIAM SUNDARANAR UNIVERSITY TIRUNELVELI, INDIA

09 - 12
FEB 2026

In Collaboration with

SACRED HEART COLLEGE (AUTONOMOUS) TIRUPATTUR, TAMIL NADU, INDIA

AZENTRA GLOBAL, NAGERCOIL, TAMIL NADU, INDIA

@ University of Jaffna, Thirunelvely, Jaffna, Sri Lanka

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Introduction

Welcome!

It gives us immense joy to welcome you to the International Conference on Environmental Health and Resilience, jointly organised by the Human Resource Development Centre of Scott Christian College (Autonomous), Nagercoil, Tamil Nadu, India with the University of Jaffna, Thirunelveli, Jaffna, Sri Lanka in association with Sacred Heart College (Autonomous), Tirupattur, Tamil Nadu, India and in friendly partnership with the CSI Jaffna Diocese. This significant academic and ecumenical gathering will be held on 09 - 12 February 2026, in Sri Lanka.

This conference is envisioned as a platform of solidarity, dialogue, and action, drawing together scholars, faith communities, and change-makers from across the globe to address one of the most pressing calls of our time, safeguarding human health and the environment in the spirit of sustainability and resilience.

In harmony with the spirit of creation care, we acknowledge God's Creation and recognise the Earth as a divine gift entrusted to us. Our shared well-being is inseparably linked with the well-being of our common home. As co-creatures within God's Creation, we are called to nurture, protect, and restore the integrity of life in all its forms.

The theme of this conference: "**Environmental Health and Resilience**" invites us to reflect deeply on the interconnections between ecology, health, spirituality, and human responsibility. Through plenary sessions, research presentations, panel discussions, and collaborative exchanges, we aspire to generate pathways of hope and action that will empower communities to build resilience while upholding justice and peace with creation.

We look forward to welcoming you to Sri Lanka as we come together to share knowledge, celebrate collective wisdom, and work towards a healthier and more sustainable world for generations to come.

Organising Team

Objectives & Conference Logo

OBJECTIVES

- Fostering cross-disciplinary collaboration among researchers, practitioners, and policymakers to tackle health and environmental sustainability challenges
- Providing a platform for sharing best practices, innovations, and case studies that build resilient health systems and sustainable environments
- Promoting integrated policies that align health and environmental goals for sustainable development
- Building community awareness to inspire grassroots action and participation in sustainable health and environmental practices
- Facilitating knowledge exchange to advance research and practical solutions in health and environmental sciences

CONFERENCE LOGO

The logo is a combination of elements that often carry symbolic meaning:

Tree with green leaves: symbolises life, growth, nature, & environmental sustainability

Open Book: represents knowledge, learning, wisdom, & potentially religious texts or scientific understanding

Wooden Cross: a prominent Christian symbol representing faith, spirituality, & sacrifice

Circular shape: the encompassing circle suggests wholeness, unity and interconnectedness

The combination of these elements within a single symbol suggests a holistic approach to sustainable health and environmental resilience, possibly emphasizing the role of faith and education along with ecological concerns

Thrust Areas

- Environmental Health and Resilience
  - Climate change and adaptation
  - Biodiversity and conservation
  - Environmental justice and health
  - Disaster risk reduction and ecosystem restoration
  - Interdisciplinary approaches to sustainable development
  - Bioremediation phyto and nano remediation

- Language and Literature
  - Studies in linguistics, literature, and communication
  - Literature and ethics in environmental health

- Engineering, Technology and Management
  - Innovations in engineering and business
  - Innovative technologies for environmental resilience

- Physical, Chemical and Mathematical Sciences
  - Research in core and applied sciences
  - Mathematical models for environmental health and sustainability

- Health Sciences and Nutrition
  - Topics in healthcare, biology, nutrition, sustainable agriculture and food safety
  - Sustainable agriculture and food security
  - Eco- theology and public health

- Biological Sciences
  - Bio-prospecting Therapeutics and Neutraceutical
  - Sustainable Aquaculture

- Social Sciences
  - Cultural perspectives on environmental conservation
  - Sociology, economics, education and policy

Collaborating Institutions

INTERNATIONAL CONFERENCE ON
ENVIRONMENTAL HEALTH AND RESILIENCE

Organising Institutions

Scott Christian College

Founded in 1893, Scott Christian College is a premier autonomous institution affiliated to Manonmaniam Sundaranar University, Tirunelveli and managed by the **Church of South India, Kanyakumari Diocese**. Guided by its motto, ***The Truth Shall Make You Free***, the college offers a diverse range of programmes including 17 undergraduate, 15 postgraduate, and 11 research programmes. Accredited with A+ grade by NAAC in its fourth cycle, Scott Christian College emphasises value-based, holistic education that fosters intellectual growth and ethical responsibility. With a vibrant research culture and strong community engagement, the college is dedicated to nurturing responsible and compassionate citizens ready to face global challenges with integrity.

University of Jaffna

Established in 1974, the University of Jaffna stands as a leading institution committed to higher education, cultural preservation, and regional development. With 12 branches and 57 academic departments, it serves over 7,000 students, including postgraduate and external learners. The University's main campus is in Jaffna, with expansions in Kilinochchi and Kilinochchi and it is home to the renowned Ramanathan Academy of Fine Arts and the Department of Siddha Medicine. Despite decades of socio-political challenges, the University of Jaffna has shown remarkable resilience and continues to be a beacon of hope and learning in Northern Sri Lanka.

Manonmaniam Sundaranar University

Manonmaniam Sundaranar University is a prominent public state university in Tamil Nadu, India, dedicated to its motto of "Reaching the Unreached" across the four southernmost districts. Established in 1990 and recognized by the UGC with a NAAC 'A' grade, the university operates from a sprawling 550-acre main campus, serving approximately 104 affiliated colleges. The university offers a robust academic environment through its 24 diverse departments, encompassing arts, sciences, and technology programmes at all academic levels. The university is committed to global engagement and skill development, delivering off-campus and vocational education initiatives.

Sacred Heart College

Established in 1951 in Tirupattur, Tamil Nadu, Sacred Heart College is administered by the Salesians of Don Bosco and affiliated to the Thiruvalluvar University. Accredited with A++ grade by NAAC in the fifth cycle, it secured the 47th rank in NIRF 2024. The institution offers undergraduate, postgraduate, and research programmes across Arts, Commerce, Science, Professional, and Social Work, emphasizing integral human development, ethical values, social responsibility and entrepreneurial skills, particularly for the marginalised.

Azentra Global

Founded in 2025 and headquartered in Nagercoil, Azentra Global is a future-ready technology partnership delivering AI-driven, research-backed software and application solutions. Guided by "Gateway to Global Success," the company empowers businesses, startups, and institutions globally through innovation, digital transformation, education, and a strong customer-centric approach with scalable products and services.

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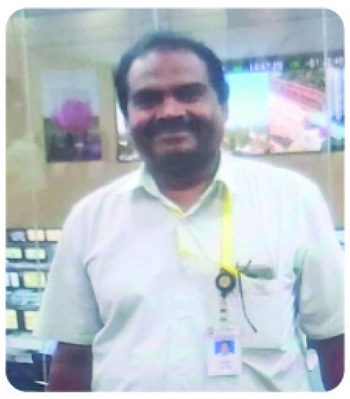

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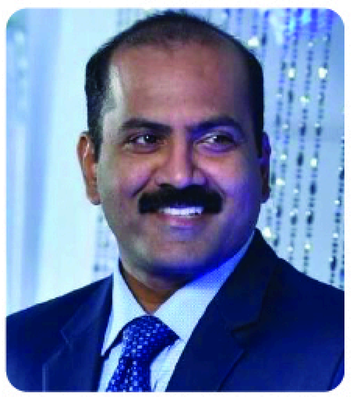

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Manuscripts should be prepared in English and submitted in MS Word format following standard academic structure, including title, author details, abstract, keywords, main content, and references. Authors are responsible for ensuring clarity, accuracy, and proper citation of sources in accordance with accepted scholarly standards.

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Message From the Esteemed Dignitaries

Church of South India
Kanyakumari Diocese
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Rt. Rev. Dr. S. Christopher Vijayan, B.A., B.D., M.Th., D.Min
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04 February 2026

To

Dr. M. P. Jeyasekhar
Organizing Chair
ICEHR 2026
At Sri Lanka.

Prof. Thulasitha William Shanthakumar
Professor in Zoology &
Co-organizing Chair
ICEHR 2026 at Sri Lanka.

Dear friends in Christ,

Greetings in the blessed name of our Lord Jesus Christ!

I am extremely happy to learn that Scott Christian College (Autonomous), Nagercoil, under the Church of South India, Kanyakumari Diocese, South India, and the University of Jaffna, Sri Lanka, are jointly organizing the *International Conference on Environmental Health and Resilience (ICEHR 2026)*, in collaboration with Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, Sacred Heart College (Autonomous), Tirupattur, Tamil Nadu, and Azentra Global, Nagercoil, Tamil Nadu.

I sincerely wish and pray that the Lord Almighty, who grants wisdom to explore new possibilities, may abundantly bless the organizers and participants of this esteemed conference. As we are living in a world where we are experiencing severe climate change, loss of biodiversity, pollution, and depletion of natural resources, this conference will greatly help in understanding the critical impacts and to explore alternative and sustainable methodologies. It is indeed a timely initiative to identify pressing social and environmental issues and to guide our nations toward preventing further damage of God's creation.

The CSI Kanyakumari Diocese, always stands in solidarity with the CSI Jaffna Diocese, and supports the initiatives of the University of Jaffna, Sri Lanka.

The people of Sri Lanka are close to our hearts and thoughts.

Wishing the conference every success.

With prayerful wishes and blessings,

Yours sincerely

Bishop

BISHOP
C.S.I. Kanyakumari Diocese
Nagercoil - 629 001

Message From the Esteemed Dignitaries

Rt. Rev. Dr. V. Pathmathayalan

Bishop, Jaffna Diocese
Church of South India (JDCSI)
Sri Lanka

It is my great pleasure to deliver this message for the International conference on Environmental Health and Resilience ICEHR-2026 is jointly organized by the Department of Zoology, Faculty of Science, University of Jaffna, and the Human Resource Development Centre (HRDC), Scott Christian College (Autonomous), Nagercoil, Tamil Nadu, India in collaboration with Manonmaniam Sundaranar University, Tirunelveli, Tamil-Nadu, India, Sacred Heart College (Autonomous), Tirupattur, Tamil Nadu, India and Azentra Global, Nagercoil, Tamil Nadu, India.

It is with deep appreciation and hopel extend my greetings and blessings to the organizers, scholars, researchers, and participants of the International Conference. I commend the joint efforts of Scott Christian College (Autonomous), Nagercoil, the University of Jaffna, and the collaborating institutions for envisioning and convening this timely and significant international forum.

In an age marked by ecological fragility, climate uncertainty, and widening social vulnerabilities, the theme, Environmental Health and Resilience speaks directly to the moral and scientific responsibility entrusted to humanity. Care for creation is not merely a scientific or policy concern; it is an ethical calling that demands wisdom, compassion, and collective action. This conference, by bringing together disciplines such as environmental science, public health, sustainability studies, biodiversity conservation, as well as art, literature, and culture, reflects a holistic vision of resilience ,one that recognizes the deep interconnection between nature, human well-being, and cultural consciousness.

The University of Jaffna hosting this conference holds special significance, as it stands as a symbol of learning, reconciliation, and renewal. I am confident that the deliberations during these days will foster meaningful dialogues, innovative research collaborations, and practical pathways towards protecting our planet while safeguarding the dignity and health of present and future generations.

May ICEHR 2026 inspire minds to seek truth, hearts to cherish creation, and hands to work together for a just, sustainable, and resilient world. I wish the conference every success and invoke God's abundant blessings upon all who contribute to this noble endeavor.

Prayers and Best Wishes

Message From the Esteemed Dignitaries

Er S Byju Nizeth Paaul
Secretary
CSI Kanyakumari Diocese,
India

The International Conference on Environmental Health and Resilience (ICEHR 2026) stands as a timely and meaningful academic endeavour that responds to a pressing concern of our age - the fragile relationship between humanity and the natural world. Convened through the collaborative commitment of institutions across national and disciplinary boundaries, the conference created a vibrant platform for scholarly dialogue, critical reflection and constructive engagement.

Over four intellectually enriching days, the conference brought together eminent academicians, scientists, environmental practitioners and young researchers who explored diverse perspectives on environmental sustainability, public health, ecological ethics and resilience-building strategies. The carefully structured plenary sessions, keynote addresses, panel discussions and paper presentations reflected both depth of scholarship and relevance to contemporary global challenges. The thematic progression from environmental health to preservation and resilience enabled participants to trace the silent yet powerful narratives of the Earth and be responsible stewards of the future.

A distinctive significance of this conference is the integration of academic rigor with moral responsibility. Rooted in values of justice, care and stewardship, the deliberations echoed a shared conviction that sustainable development must be guided not merely by technological advancement, but by ethical consciousness and collective action. The active participation of institutions from India and Sri Lanka further strengthened the spirit of regional cooperation and intellectual solidarity.

From the perspective of the CSI Kanyakumari Diocese, this conference resonates deeply with our faith-driven commitment to care for creation, social responsibility and ethical leadership. Academic platforms such as this not only disseminate knowledge but also nurture conscience, compassion and collective resolve. I hope that the insights documented in these proceedings will inspire continued research, informed policy discourse and responsible environmental practices. I commend the organising institutions Scott Christian College (Autonomous), India and the University of Jaffna, Sri Lanka, collaborators and participants for their vision, dedication and scholarly excellence and trust that this conference will leave a lasting imprint on academic thought and societal action.

Message From the Esteemed Dignitaries

Rev. Dr. Praveen Peter, SDB
Rector
Sacred Heart College (Autonomous)
Tirupattur, Tirupattur District

It is my great pleasure to present this message on the occasion of the International Conference on Environmental Health and Resilience (ICEHR 2026), scheduled to be held from 09 to 12 February 2026 at the University of Jaffna, Sri Lanka. This prestigious conference is jointly organized by Scott Christian College, India; University of Jaffna, Sri Lanka; Sacred Heart College, India; and Manonmaniam Sundaranar University, India, as a meaningful MoU-based academic activity that strengthens international collaboration and shared research goals.

The theme of ICEHR 2026 addresses critical global challenges related to environmental health, sustainability, and resilience. The conference provides an excellent platform for academicians, researchers, scientists, policy makers, and students to exchange ideas, present research outcomes, and engage in constructive discussions aimed at sustainable solutions for present and future generations.

I sincerely appreciate the Human Resource Development Centre (HRDC) and the Management of Scott Christian College for their constant encouragement, administrative support, and vision in promoting international academic partnerships. I also extend my heartfelt thanks to the Organizing Chairs and Organizing Committee members, whose dedication, careful planning, and coordinated efforts have been instrumental in the successful organization of this international conference.

I am confident that the deliberations, research presentations, and interactions during ICEHR 2026 will contribute significantly to knowledge dissemination and foster long-term academic and research collaborations. I wish the conference every success and hope that all participants have a productive, enriching, and memorable academic experience.

Message From the Esteemed Dignitaries

Prof. S. Srisatkunarajah
Vice-Chancellor
University of Jaffna, Sri Lanka

The Department of Zoology of the Faculty of Science, one of the well-established departments of the University of Jaffna, is celebrating its Golden Jubilee, marking 50 years of committed academic pursuit. Over the years, the Department of Zoology has consistently demonstrated its commitment to research relevant to environmental sustainability and regional development through the study of both living and non-living components of diverse ecosystems.

In this context, the International Conference on Environmental Health and Resilience – 2026 (ICEHR-2026), being organized jointly by the Department of Zoology, University of Jaffna, Sri Lanka, and the Human Resource Development Centre (HRDC), Scott Christian College (Autonomous), Nagercoil, Tamil Nadu, India adds further significance to this milestone celebration. It is particularly noteworthy that eminent scientists from Sri Lanka and India participate in the conference as resource persons, delivering keynote addresses and sharing their expertise.

It is with great pride and enthusiasm that I extend a warm welcome to ICEHR-2026. Building on the success of previous initiatives, this conference promises to serve as an exceptional platform for both local and international researchers to convene, exchange ideas, and present innovative research findings related to environmental health, resilience, and climate change.
Research is the cornerstone of advancing new methodologies, conceptual frameworks, and evolving perspectives across disciplines. As the Vice-Chancellor of the University of Jaffna, I firmly believe that research conferences such as ICEHR-2026 play a pivotal role in fostering academic collaboration and disseminating valuable knowledge within the global scholarly community.

The Faculty of Science has a long-standing tradition of producing distinguished scholars in biological sciences, chemical and physical sciences, mathematics and statistics, and computer science. The active engagement of our academic staff, students and international collaborators is reflected in their numerous research publications. Under the main theme “Environmental Health and Resilience,” ICEHR-2026 encompasses seven focal areas: Environmental Health and Resilience; Language and Literature; Engineering, Technology, and Management; Physical, Chemical, and Mathematical Sciences; Health Science and Nutrition; Biological Sciences; and Social Sciences. The conference is further strengthened through collaboration with Manonmaniam Sundaranar University, Tirunelveli; Sacred Heart College (Autonomous), Tirupattur; and Azentra Global, Nagercoil, Tamil Nadu, India.
I take immense pride in the commitment shown by the Department of Zoology in organizing ICEHR-2026. I am confident that this conference will serve as a significant platform for regional, national, and international academics, young researchers, and scientists to share their knowledge and experiences. I sincerely thank the dedicated members of the organizing committees from Sri Lanka and India and congratulate them on their efforts toward making this event a resounding success.

Message From the Esteemed Dignitaries

Prof. P. Ravirajan
Senior Professor of Physics and Dean
Faculty of Science,
University of Jaffna, Sri Lanka

It gives me great pleasure to extend my warm greetings to all delegates, researchers, academics, practitioners, and students participating in the International Conference on Environmental Health and Resilience – 2026. I am delighted that this timely and significant conference is being jointly organised by the Department of Zoology, Faculty of Science, University of Jaffna, in collaboration with the Human Resource Development Centre, Scott Christian College (Autonomous), Nagercoil, and other esteemed partner institutions from India and beyond. As the Dean of the Faculty of Science, University of Jaffna, I am pleased to extend all necessary logistical support to ensure the successful organisation of this conference at the Faculty.

In an era marked by climate change, emerging health challenges, and increasing pressure on natural ecosystems, the theme Environmental Health and Resilience is both highly relevant and urgent. The objectives of this conference—fostering interdisciplinary collaboration, sharing best practices and innovative solutions, strengthening policy dialogue, and enhancing community awareness reflect a holistic and forward-looking approach to sustainable development.

The broad range of thematic areas addressed by the conference, encompassing environmental health, biological and physical sciences, engineering and technology, health sciences and nutrition, social sciences, as well as language and literature, highlights the inherently interdisciplinary nature of resilience and sustainability. Such an inclusive academic platform is essential for addressing complex global challenges that transcend traditional disciplinary boundaries.

I am particularly encouraged by the strong participation in this conference, with over one hundred registered delegates from Sri Lanka and more than seventy participants from India and other countries. The acceptance of over one hundred research abstracts is a testament to the academic interest, quality of research, and both regional and international relevance of this event. This diversity of perspectives will undoubtedly enrich scholarly discourse and promote meaningful knowledge exchange.

I commend the organising committee, collaborating institutions, and sponsors for their dedication and tireless efforts in bringing this conference to fruition. I am confident that the deliberations and outcomes of this conference will make a significant contribution to advancing research, informing policy, and promoting resilient and sustainable health and environmental practices.

I wish the conference every success and trust that all participants will find the sessions intellectually stimulating, professionally rewarding, and conducive to forging lasting academic and institutional partnerships.

Message From the Esteemed Dignitaries

Dr. D. Henry Raja
Principal i/c,
Scott Christian College (Autonomous),
Nagercoil, Tamil Nadu, India

It is with great pleasure that I welcome you to the International conference organised by the HRDC, of our college, to be held in Jaffna from 9 to 12 February, 2026. As we convene, the world faces unprecedented environmental challenges from climate-induced health crises to rapid urbanization that demand immediate, collective action.

Our theme this year, Environmental Health and Resilience, emphasise that the future of environmental health is not merely about surviving disruptions, but about fostering sustainable, adaptive, and regenerative systems.

We from Scott Christian College in collaboration with University of Jaffna, Thirunelvely, Jaffna, Sri Lanka, Manonmaniam Sundaranar University, Tirunelveli, TamilNadu, India, Sacred Heart College (Autonomous), Tirupattur, Tamil Nadu, India, Azentra Global, Nagercoil, Tamil Nadu, India thank all those who are working behind to make the conference valuable and memorable.

This conference aims to bridge the gap between scientific research and actionable policy among globally renowned universities. The goal is to convert environmental data into proactive health strategies, with a focus on vital issues such as air quality, urban livability, and community resilience. Sustainable health and environmental resilience involve creating healthcare systems that can withstand climate-related challenges while minimizing their environmental impact. Key strategies include utilizing renewable energy, implementing sustainable waste management practices, building resilient infrastructure, and reducing carbon emissions. This approach ensures continuous delivery of high-quality care during crises, safeguards public health, and promotes global sustainability objectives.

Sri Lanka and India share striking similarities in climate change impacts, primarily driven by their shared monsoon systems, geographical proximity, and reliance on the warming Indian Ocean. Both nations are experiencing rising temperatures, erratic rainfall, and increasing, more frequent extreme weather events.

I specially thank our beloved Bishop, Secretary, Treasurer of our Diocese for supporting us to arrange a conference of such standards in Jaffna University, Srilanka. Special thanks to Prof. M. P. Jeyasekhar, HRDC Coordinator, Prof. Thulasitha W. Shanthakumar, Professor of Zoology, University of Jaffna, Prof. DR. S. Kalidass, Head, Department of Animal Science, Manonmaniam Sundaranar University, Prof. D. Daniel Lawrence, Head, PG & Research Department of Physics, Sacred Heart College, Tirupattur,
I invite you to engage, collaborate, and share your insights. Let us work together to strengthen the fabric of our environmental systems, ensuring they continue to support human well-being for generations to come.

Welcome to a fruitful and inspiring conference.

Message From the Esteemed Dignitaries

Rev. Dr. D. Maria Antony Raj,
Principal
Sacred Heart College (Autonomous)
Tirupattur, Tirupattur District, Tamil Nadu, India

Dear Organisers, Distinguished Guests, and Esteemed Participants,

It gives me immense joy to extend my greetings to all gathered for this International Conference on "Environmental Health and Resilience (ICEHR 2026)." The collaboration between the University of Jaffna, Scott Christian College, Sacred Heart College, and Manonmaniam Sundaranar University is a shining example of academic solidarity across borders, united by a common concern for the well-being of our planet and its people.

The theme of this conference is both timely and urgent. Environmental health is inseparable from human health, and resilience is the key to sustaining life amidst the challenges of climate change, pollution, pandemics, and ecological degradation. As the world faces unprecedented environmental crises, the need for innovative research, sustainable practices, and collective responsibility has never been greater.

This gathering provides a vital platform to share knowledge, exchange ideas, and inspire action. It reminds us that resilience is not only about surviving adversity but also about transforming challenges into opportunities for growth, sustainability, and justice. The discussions here will undoubtedly contribute to shaping policies, guiding communities, and empowering future generations to live in harmony with nature.

I warmly congratulate the organisers for their vision and commitment, and I wish all participants fruitful deliberations. May this conference foster collaboration, strengthen academic bonds, and ignite new pathways toward a healthier and more resilient world.

With best wishes for the success of the event.

Chair Person's Message

Dr. M. P. Jeyasekhar
Associate professor, Department of Zoology
Bursar & HRDC Coordinator
Scott Christian College (Autonomous)

"The health of our planet and the resilience of our communities are inseparably linked; safeguarding one is the surest way to sustain the other."

Dear Delegates, Scholars, and Esteemed Participants,

It gives me immense pleasure to extend my warm greetings to all for the International Conference on Environmental Health and Resilience (ICEHR–2026), scheduled to be held from 09 to 12 February 2026 at the University of Jaffna, Sri Lanka.

ICEHR-2026 is designed as a response to the critical need for collective reflection, interdisciplinary engagement, and sustained collaborative action on environmental health and resilience, aiming to cultivate responsible and sustainable global citizenship through a platform for scholarly dialogue, knowledge dissemination, and innovative thinking.

Founded in 1893, Scott Christian College (Autonomous), Nagercoil, is a premier institution known for its legacy of academic excellence, research innovation, and value-based education. Guided by its motto, "The Truth Shall Make You Free," the college fosters intellectual growth rooted in ethical responsibility and social commitment. Accredited with an A+ grade by NAAC (Fourth Cycle), the institution continues to contribute significantly to national and international academic endeavours.
The conference is jointly organised by the Human Resource Development Centre (HRDC), Scott Christian College (Autonomous), and the University of Jaffna, Sri Lanka, in collaboration with Manonmaniam Sundaranar University, India; Sacred Heart College (Autonomous), India; and Azentra Global, India, reflecting a strong and dynamic network of academic partnership.

At this juncture, I wish to record our deep sense of gratitude to the Rt. Rev. Dr. S. Christopher Vijayan, Bishop, CSI Kanyakumari Diocese and the Rt. Rev. Dr. V. Pathmathayalan, Bishop, Jaffna Diocese (JDCSI), Er. S. Byju Nizeth Paaul, Secretary, CSI Kanyakumari Diocese whose spiritual guidance, encouragement, and goodwill have greatly strengthened the moral and institutional foundation of this international academic endeavour. I also extend my sincere appreciation to Dr. D. Henry Raja, Principal in-charge, Scott Christian College (Autonomous) for their continued support and encouragement.

My heartfelt thanks are further extended to Prof. S. Srisatkunarajah, Vice-Chancellor, University of Jaffna, Sri Lanka, whose visionary academic leadership and generous institutional support have been instrumental in facilitating the successful organisation of ICEHR–2026 at this esteemed university.

I place on record my profound appreciation to Prof. Thulasitha W. Shanthakumar, Conference Chair and Co-Organising Chair (University of Jaffna), for her exemplary academic leadership and collaborative spirit. I also acknowledge with gratitude the contributions of the Organizing Secretaries and the entire Organizing Team. ICEHR–2026 represents a continuation of Scott Christian College's long-standing engagement in international scholarship. Following the successful organisation of earlier international conferences held at Multimedia University, Malaysia, Curtin University, Dubai, and a nationally significant conference in Kashmir themed on exploring cross-cultural perspectives across India—from Kanyakumari to Kashmir—the present conference in Sri Lanka marks another important milestone in strengthening global academic collaboration and intellectual exchange.

Looking ahead, Scott Christian College envisions ICEHR as an ongoing international academic initiative, fostering sustained research partnerships and future conferences across diverse global contexts. I am confident that ICEHR–2026 will be a rewarding and intellectually enriching experience for all participants. I extend my best wishes for the grand success of the conference.

Chair Person's Message

Prof. Thulasitha William Shanthakumar
Professor of Zoology
University of Jaffna
Thirunelvely, Jaffna, Sri Lanka

We are delighted to collaborate with the Human Resource Development Centre, Scott Christian College (Autonomous), Nagercoil, India in organising the International Conference on Environmental Health and Resilience – ICEHR-2026 in association with Manonmaniam Sundaranar University, Tirunelveli, India, Sacred Heart College (Autonomous), Thirupattur, India and Azentra Global, Nagercoil, India at the University of Jaffna. As we are aware, environmental factors remain one of the major global risks to healthy life on Earth. However, collective efforts to overcome the environmental issues are still challenging. As such, we believe that multi-disciplinary research and conferences like this ICEHR-2026, will provide a platform for researchers from diverse fields to address the complex relationship between our physical environment and life forms. The conference aims at covering diverse disciplines such as environmental health and resilience such as climate change and adaptation, biodiversity and conservation, environmental justice and health, disaster risk reduction and ecosystem restoration, and sustainable infrastructure and development; language and literature, engineering technology and management, Physical, chemical and mathematical Sciences, and Social Sciences.

We strongly believe that this conference will provide an opportunity for academics, researchers and policy makers in the region to exchange their knowledge and experiences, research findings and foster inter disciplinary collaborations in the field of Environmental Sciences. More than 100 abstracts accepted for presentation after reviewed by the experts. In addition, we strongly believe that some of the important facts and issues in the field of environmental sciences will be touched by key note speakers. We extend our heartfelt appreciation to them.

We extend our sincere gratitude to our co-organizers, the Scott Christian College (Autonomous), Nagercoil, India, particularly Prof. M. P. Jeyasekhar and team for their invaluable support, tireless efforts including the financial support in conducting this International Conference a success. I also wish to thank other collaborators such as Manonmaniam Sundaranar University, Sacred Heart College (Autonomous), and Azentra Global, Nagercoil, India for their support. Further, I wish to thank all the organising committee members from India and Sri Lanka for their valuable contribution.

As a conference organising chair from the University of Jaffna, Sri Lanka, I sincerely thank Bishop. Rt. Rev. Dr. V. Pathmathayalan, the Bishop of JDCSI, for making this collaboration a success. And I wish to extend my gratitude to our Vice-Chancellor, our Dean, and the staff members of the Faculty of Science for their valuable support and guidance.

I hope ICEHR-2026 will be a very successful academic event.

Chair Person's Message

Dr. S. Kalidass Subramaniam
Head, Department of Animal Science & Syndicate Member
Manonmnaniam Sundaranar University
Tirunelveli, Tamil Nadu, India

It is both an honour and a privilege to address this august gathering at the International Conference, which brings together scholars and practitioners from diverse disciplines to deliberate on one of the most critical challenges of our time environmental health and resilience in a rapidly changing world.

I consider it a great honour to be part of this distinguished conference representing Manonmaniam Sundaranar University. This forum provides an excellent platform for academic exchange, and I am confident that it will pave the way for meaningful collaborations and the establishment of fruitful Memoranda of Understanding with the partnering institutes and other participating delegate institutions.

Equally vital is the translation of scientific knowledge into effective policy, education, and community engagement. Research must guide regulation, and regulatory frameworks must be strengthened through public awareness and responsible behavioural change.

For developing and tropical nations, these challenges are particularly complex. Rapid urbanization, inadequate waste management practices, and increasing plastic consumption place tremendous pressure on fragile ecosystems. At the same time, these regions are endowed with rich biodiversity and traditional ecological knowledge, offering unique opportunities for innovative and sustainable solutions.

International collaboration is therefore indispensable. Conferences such as this serve as vital platforms for sharing expertise, harmonizing scientific approaches, and collectively building resilient environmental strategies that transcend national boundaries.

I also take this opportunity to express my sincere gratitude to the administrators of Manonmaniam Sundaranar University—our Honourable Vice-Chancellor, the Registrar, and the Syndicate—for their continued encouragement and support, which greatly strengthen opportunities for future academic collaborations and institutional partnerships.

I sincerely hope that the deliberations and collaborations emerging from this conference will contribute meaningfully to environmental resilience and sustainable development. I congratulate the organizers on this timely initiative and wish the conference every success.

Thank you.
Jai Hind

Chair Person's Message

Prof. D. Daniel Lawrence
Head, Department of Physics
Sacred Heart College (Autonomous)
Tirupattur, Tirupattur District

Respected International and National Delegates,

International conferences play a vital role in addressing global challenges by bringing together scholars, researchers, and professionals from diverse disciplines and regions. In this context, it gives me great pleasure to be associated with the International Conference onEnvironmental Health and Resilience (ICEHR 2026), scheduled from 09 to 12 February 2026 at the University of Jaffna, Sri Lanka. The conference is jointly organized by the University of Jaffna, Sri Lanka; Scott Christian College, India; Sacred Heart College,India; and Manonmaniam Sundaranar University, India, reflecting a strong spirit of international academic collaboration.

The theme of ICEHR 2026 is highly relevant in the present global scenario, where environmental health and resilience have become critical concerns across nations. The conference provides an important platform for academicians, researchers, policy makers, and students to exchange ideas, share research outcomes, and discuss multidisciplinary approaches to sustainable solutions for environmental and public health challenges.

I express my sincere gratitude to Scott Christian College and the University of Jaffna for associating with us during the Platinum Jubilee celebrations of Sacred Heart College, India. This collaboration is a moment of pride for our institution and marks a significant step toward strengthening our global academic presence. The interactions and partnerships developed through this conference will greatly contribute to expanding our international network and enhancing a strong multidisciplinary research culture.

I also place on record my appreciation to the Management of Scott Christian College for their encouragement and institutional support. My heartfelt thanks are due to the Organizing Chairs and Organizing Committee members of all partnering institutions for their dedicated efforts, coordination, and commitment, which have been instrumental in the successful organization of this international conference.

I am confident that ICEHR 2026 will lead to meaningful academic exchanges, lasting collaborations, and impactful research outcomes. I wish the conference every success and hope that all participants find the deliberations enriching and inspiring.

Chair Person's Message

Godwin Raja
Founder & CEO
Azentra Global
Tamil Nadu, India

It is an honour to be part of the International Conference on Environmental Health and Resilience (ICEHR 2026).

I sincerely acknowledge the efforts of the organizers Scott Christian College, India; the University of Jaffna, Sri Lanka; and Manonmaniam Sundaranar University, India for establishing a global platform that encourages dialogue across disciplines and borders. This initiative reflects a shared commitment to addressing challenges that demand both scientific insight and responsible leadership.

I also appreciate the role of the collaborative partners, Sacred Heart College, India, and Azentra Global, India, whose involvement highlights the growing importance of academia–industry collaboration in translating knowledge into real-world impact.

Today, environmental health is no longer a topic limited to laboratories or policy documents. It has become a core concern for governments, industries, institutions, and businesses alike. How we design our cities, build technologies, manage resources, and educate future generations will define the resilience of our societies.

Resilience is not merely about responding to crises. It is about foresight, adaptability, and building systems that are sustainable, inclusive, and future-ready. The choices we make today—guided by research, innovation, and ethical responsibility will shape the quality of life for generations to come.

The true value of a conference lies in its ability to move ideas beyond discussion into action. The collective vision demonstrated through this conference sets a strong foundation for long-term impact. I am confident that the outcomes of ICEHR 2026 will contribute meaningfully to a healthier and more resilient world.

I wish ICEHR 2026 every success and all participants a meaningful and impactful academic journey.

Keynote Lecture

Dr. S. Wijeyamohan
Department of Bio-Science
Faculty of Applied Science, Adjunct Faculty
Missouri University
University of Vavuniya

This paper examines what "development" has meant for us in the North by looking at our environmental health, the resilience of our land, and the ways our relationship with nature has changed before, during, and after the war. Before the conflict, our environment was our greatest strength. The Vanni's dense forests, clean groundwater, and healthy coastal ecosystems supported our wellbeing. Our air was clean, our wells gave us safe water, and our children cycled to school through roads free of pollution. We lived simply but sustainably, in a landscape that quietly nurtured our physical and mental health.

During the war, when everything else collapsed, it was this environment that kept us alive. With no external supplies, electricity and fertilisers, we survived on organic food we grew ourselves. The forests, the sea, and the groundwater fed and protected us. Even amidst violence, the natural world regenerated—forests grew thicker, wildlife returned, and ecosystems recovered. Our environment showed remarkable resilience, offering stability when human systems failed.

After the war, more than 80,000 hectares were declared protected lands without consulting the communities who once lived in harmony with them, displacing people and creating new pressures on limited land. Projects marketed as green or profitable—wind farms, sand mining, sea cucumber farms, and proposed massive solar parks—have flooded lands, polluted wells, disrupted livelihoods, and threaten to damage fragile ecosystems that maintain our environmental health. Even proposals like the Mandaitivu cricket stadium threaten the Jaffna lagoon, mangroves, and migratory birds that have been part of our ecological balance for centuries.

This paper argues that true resilience lies not in concrete, but in protecting the natural systems that protect us. Real development must safeguard groundwater, forests, clean air, and coastal ecosystems while empowering people to live alongside nature—not fenced away from it. Having survived war through the strength of our environment, we must now ensure that peace strengthens, rather than destroys, the environmental health and resilience of the North.

Keynote Lecture

Dr. N. Richard Kennady, Ph.D., YSF
Professor (Horticulture)
Horticultural Research Station
Pechiparai – 629 161
Kanniyakumari District

Environmental health resilience refers to the capacity of individuals, communities, and systems to prepare for, absorb, recover from, or adapt to environmental hazards and disruptions, such as climate change, pandemics, or pollution crises. It goes beyond sustainability, which focuses on maintaining current conditions, to emphasize the ability to withstand and bounce back from "shocks"—natural or man-made—without collapsing into an undesirable, unmanageable state. The core components of environmental health resilience includes climate – Resilient Health systems, Water and sanitation safety, Bio diversity and ecosystem protection and community capacity building .

Strengthening environmental health resilience requires a multi-faceted approach involving policy, technology, and community action. The future of environmental health depends on shifting from reactive, emergency-driven approaches to proactive,, planned adaptation. By integrating resilience into urban planning, health policy, and environmental management, society can reduce vulnerability and promote health. Environmental health resilience is not just about avoiding disaster; it is about creating a system that can thrive despite challenges. Whether it's ensuring that protecting the water supply from drought, or ensuring that cities can manage heat waves, building resilience is a necessary investment in a sustainable and secure future.

I am delighted to extend warm greeting to all participants of the “International conference on Environmental Health and Resilience (ICEHR). This conference, jointly organized by HRDC of Scott Christian College, University of Jaffna, Sri Lanka, Manonmaniam .Sundaranar University (India), Sacred Heart College, Thirupattur (India) and Azentra Global, brings together experts and researchers from around the globe to share their knowledge and insights on the latest technologies and practices in environmental health. Through such collaborations and exchanges, we can ensure innovation and make meaningful progress towards building a safe and sustainable environment. I commend the organizers for bringing together such diverse knowledge group of participants. I am confident that this conference’s discussions and outcomes will contribute significantly to the environmental health.

I wish all participants a fruitful and inspiring conference!

Keynote Lecture

Dr. S. Kalidass Subramaniam
Head, Department of Animal Science & Syndicate Member
Manonmnaniam Sundaranar University
Tirunelveli, Tamil Nadu, India

Microplastic Pollution and Environmental Resilience: From Emerging Risks to Global Biological Solutions

Plastics have become integral to modern economies and lifestyles; however, their extensive use has resulted in a persistent and far-reaching environmental burden. Among the most pressing consequences is microplastic pollution—an invisible yet pervasive global threat that challenges environmental health and sustainability.

Microplastics, defined as plastic particles smaller than five millimetres, are now detected across all ecosystems, including oceans, polar regions, freshwater systems, soils, and even the atmosphere. Their documented presence in food chains, drinking water, and human tissues underscores the transboundary nature of this problem and its profound implications for ecosystem stability, food security, and public health.

From a policy and governance perspective, environmental health must be understood through the lens of ecosystem resilience—the ability of natural systems to withstand disturbances, adapt to stressors, and recover functionality. Microplastics compromise this resilience through their persistence, their capacity to adsorb and transport toxic substances, and their disruption of biological processes across multiple trophic levels.

Current mitigation strategies predominantly focus on downstream interventions such as waste management and chemical treatments. While these approaches are necessary, they are resource-intensive and insufficient in isolation. This limitation highlights the urgent need for preventive strategies, circular economy models, and nature-based solutions that align ecological processes with sustainable development goals.

Natural systems offer valuable insights in this regard. Detritivores, decomposers, and complex microbial communities have evolved highly efficient mechanisms for material transformation and nutrient cycling. Emerging research indicates that saprozoic organisms, particularly worms, can interact with microplastics through physical fragmentation and microbe-mediated transformation, presenting promising avenues for integrated and sustainable bioremediation strategies.

Microplastic pollution is not merely an environmental concern but a societal and intergenerational responsibility. Addressing this challenge demands the convergence of scientific innovation, policy foresight, and institutional support. In this context, I gratefully acknowledge the financial support of the Government of Tamil Nadu, whose visionary commitment to translational research through the Chief Minister's Research Grant (CMRG) has enabled this work. Such support exemplifies how regional leadership can catalyse globally relevant solutions, strengthening environmental resilience and advancing sustainable stewardship for future generations.

Keynote Lecture

Prof. Dr. Chithirai Pon Selvan

John Curtin Distinguished Professor
Director of Research; Head of School - Science and Engineering
Curtin University, Dubai

Soil degradation represents one of the most critical environmental challenges of the contemporary era, with profound implications for ecological stability, food security, and sustainable development. Nearly 75% of the world's land resources are degraded, and no country currently meets the minimum soil organic content recommended by the United Nations.

Soil ecosystems support more than two-thirds of terrestrial species and play a fundamental role in sustaining biodiversity, while a significant proportion of the global population continues to depend on soil-based livelihoods. The intensive and indiscriminate application of chemical fertilizers and pesticides has substantially degraded soil quality, disrupted natural biogeochemical cycles, and diminished soil fertility. This degradation has led to declining agricultural productivity, heightened risks of food shortages, and the widespread production of nutritionally poor food.

Crops cultivated in degraded soils often exhibit reduced nutrient density, posing serious risks to human health and exacerbating malnutrition, particularly in vulnerable populations.

Soil health should therefore be recognized not merely as an agricultural concern but as a central determinant of environmental sustainability and resilience. The adoption of sustainable soil management practices, technological innovations, and integrated policy frameworks aligned with the Sustainable Development Goals is essential for enhancing food quality, strengthening food security, restoring ecosystems, and fostering resilient and sustainable societies for future generations.

Keynote Lecture

Dr. S. Shobana
Senior Scientist & Head, Diabetes Food Technology
Madras Diabetes Research Foundation
Chennai, Tamil Nadu, India

Sorghum and millets (S&M) are nutri-cereals that are climate resilient and drought resistant, with strong potential to address malnutrition through nutrition-sensitive sustainable agriculture. The rising prevalence of non-communicable diseases (NCDs) in India has been partly attributed to high-glycemic-load diets dominated by refined cereals. The glycemic index of S&M-based preparations ranges from medium to high.

Randomized controlled trials using continuous glucose monitoring systems showed comparable glycemic responses between isocaloric finger millet and white rice diets. However, finger millet diets resulted in 18% lower fasting insulin levels, indicating reduced insulin demand for similar glycemic control, which is beneficial for diabetes prevention. Further studies are needed to fully establish the health benefits of S&M consumption.

Market assessments in South India revealed that refined minor millets are often marketed with claims such as “whole grain” and “diabetes friendly.” Debranning studies on five small millets demonstrated significant losses of protein, dietary fiber, phytochemicals, and minerals, emphasizing the importance of promoting S&M in whole-grain form.

Various S&M-based food products—including extruded snacks, vermicelli, porridge, pasta, and muesli—have been developed with improved nutritional, sensory, and glycemic properties. Promoting whole-grain S&M along with adequate pulses, fruits, and vegetables in daily diets can help prevent NCDs. Product innovation and glycemic index testing are essential to support the development of scalable, scientifically validated S&M-based functional foods.

Milestones

SCOTT CHRISTIAN COLLEGE

133 Years

of Academic Excellence
and Legacy

Dec 1882

Decision made by Mr. Albert Spicer and Rev. Wardlaw Thompson to promote the Seminary into a College

Dec 1892

Madras University accorded permission to the College

13th Feb 1893

Christian College was established.

16th Oct 1896

Foundation stone laid for the new building by Rev. Dr. James Duthie with the fund donated by Mr. Septimus Scott

01st Oct 1899

New building was inaugurated and the College renamed as Scott Christian College, at present the Women's Christian College campus

09th Jul 1970

The College was shifted to the present campus

Apr 2005

The Autonomy status was conferred

08th Jul 2016

Declared as one of the Greatest Institutions of higher learning in India

2017 - 2018

Quasquicentennial (125th) year of the College

28th Jul 2018

125th year Commemorative Postal Stamp released by the Government of India

2025

NAAC accredited with A+ in the fourth cycle

Introduction

Welcome!

It gives us immense joy to welcome you to the International Conference on Environmental Health and Resilience, jointly organised by the Human Resource Development Centre of Scott Christian College (Autonomous), Nagercoil, Tamil Nadu, India with the University of Jaffna, Thirunelveli, Jaffna, Sri Lanka in association with Sacred Heart College (Autonomous), Tirupattur, Tamil Nadu, India and in friendly partnership with the CSI Jaffna Diocese. This significant academic and ecumenical gathering will be held on 09 - 12 February 2026, in Sri Lanka.

This conference is envisioned as a platform of solidarity, dialogue, and action, drawing together scholars, faith communities, and change-makers from across the globe to address one of the most pressing calls of our time, safeguarding human health and the environment in the spirit of sustainability and resilience.

In harmony with the spirit of creation care, we acknowledge God's Creation and recognise the Earth as a divine gift entrusted to us. Our shared well-being is inseparably linked with the well-being of our common home. As co-creatures within God's Creation, we are called to nurture, protect, and restore the integrity of life in all its forms.

The theme of this conference: "**Environmental Health and Resilience**" invites us to reflect deeply on the interconnections between ecology, health, spirituality, and human responsibility. Through plenary sessions, research presentations, panel discussions, and collaborative exchanges, we aspire to generate pathways of hope and action that will empower communities to build resilience while upholding justice and peace with creation.

We look forward to welcoming you to Sri Lanka as we come together to share knowledge, celebrate collective wisdom, and work towards a healthier and more sustainable world for generations to come.

International Conference Organising Committee Members

Theme Overview

ENVIRONMENTAL HEALTH AND RESILIENCE

In an era marked by escalating climate change, deforestation, biodiversity loss, and resource depletion, environmental health and resilience have emerged as critical global priorities. The growing ecological imbalance and widening public health challenges call for urgent collective action to restore harmony between humanity and nature.

Eco-consciousness is the awareness of our responsibility toward the environment and the conscious effort to live sustainably with nature is central to this vision. Today's youth, as the decision-makers of tomorrow, play a pivotal role in shaping a sustainable future through their choices, values, and innovations. Their everyday habits, career paths, and civic actions have lasting implications for planetary well-being.

Unsustainable lifestyles driven by consumerism and technological excess have accelerated environmental degradation, threatening air quality, water safety, and overall human health. Nurturing eco-consciousness fosters empathy, ethical accountability, and innovation qualities essential for building resilient communities capable of withstanding environmental and health crises.

ICEHR-2026, jointly organised by Scott Christian College (Autonomous), Nagercoil Tamil Nadu, India and University of Jaffna, Thirunelveli, Jaffna, Sri Lanka in association with Sacred Heart College (Autonomous), Tirupattur, Tamil Nadu, India, seeks to provide a dynamic platform for dialogue, research, and youth-led initiatives. This international gathering underscores that environmental stewardship and holistic health are intrinsically linked, and that true resilience extends beyond scientific progress and policy reform to include community engagement, intergenerational cooperation, and faith-based responsibility.

Anchored in science, ethics, and a unified global vision, ICEHR-2026 envisions a world where ecosystems thrive, healthcare is equitable, and every individual embraces his/her role as a steward of the Earth, laying the foundation for a sustainable and resilient planet for generations to come.

Objectives & Conference Logo

OBJECTIVES

- Fostering cross-disciplinary collaboration among researchers, practitioners, and policymakers to tackle health and environmental sustainability challenges
- Providing a platform for sharing best practices, innovations, and case studies that build resilient health systems and sustainable environments
- Promoting integrated policies that align health and environmental goals for sustainable development
- Building community awareness to inspire grassroots action and participation in sustainable health and environmental practices
- Facilitating knowledge exchange to advance research and practical solutions in health and environmental sciences

CONFERENCE LOGO

The logo is a combination of elements that often carry symbolic meaning:

Tree with green leaves: symbolises life, growth, nature, & environmental sustainability

Open Book: represents knowledge, learning, wisdom, & potentially religious texts or scientific understanding

Wooden Cross: a prominent Christian symbol representing faith, spirituality, & sacrifice

Circular shape: the encompassing circle suggests wholeness, unity and interconnectedness

The combination of these elements within a single symbol suggests a holistic approach to sustainable health and environmental resilience, possibly emphasizing the role of faith and education along with ecological concerns

Thrust Areas

- Environmental Health and Resilience
  - Climate change and adaptation
  - Biodiversity and conservation
  - Environmental justice and health
  - Disaster risk reduction and ecosystem restoration
  - Interdisciplinary approaches to sustainable development
  - Bioremediation phyto and nano remediation

- Language and Literature
  - Studies in linguistics, literature, and communication
  - Literature and ethics in environmental health

- Engineering, Technology and Management
  - Innovations in engineering and business
  - Innovative technologies for environmental resilience

- Physical, Chemical and Mathematical Sciences
  - Research in core and applied sciences
  - Mathematical models for environmental health and sustainability

- Health Sciences and Nutrition
  - Topics in healthcare, biology, nutrition, sustainable agriculture and food safety
  - Sustainable agriculture and food security
  - Eco- theology and public health

- Biological Sciences
  - Bio-prospecting Therapeutics and Neutraceutical
  - Sustainable Aquaculture

- Social Sciences
  - Cultural perspectives on environmental conservation
  - Sociology, economics, education and policy

Collaborating Bodies

INTERNATIONAL CONFERENCE ON
ENVIRONMENTAL HEALTH AND RESILIENCE

Organising Institutions

Scott Christian College

Founded in 1893, Scott Christian College is a premier autonomous institution affiliated to Manonmaniam Sundaranar University, Tirunelveli and managed by the **Church of South India, Kanyakumari Diocese**. Guided by its motto, ***The Truth Shall Make You Free***, the college offers a diverse range of programmes including 17 undergraduate, 15 postgraduate, and 11 research programmes. Accredited with A+ grade by NAAC in its fourth cycle, Scott Christian College emphasises value-based, holistic education that fosters intellectual growth and ethical responsibility. With a vibrant research culture and strong community engagement, the college is dedicated to nurturing responsible and compassionate citizens ready to face global challenges with integrity.

University of Jaffna

Established in 1974, the University of Jaffna stands as a leading institution committed to higher education, cultural preservation, and regional development. With 12 branches and 57 academic departments, it serves over 7,000 students, including postgraduate and external learners. The University's main campus is in Jaffna, with expansions in Kilinochchi and Kilinochchi and it is home to the renowned Ramanathan Academy of Fine Arts and the Department of Siddha Medicine. Despite decades of socio-political challenges, the University of Jaffna has shown remarkable resilience and continues to be a beacon of hope and learning in Northern Sri Lanka.

Manonmaniam Sundaranar University

Manonmaniam Sundaranar University is a prominent public state university in Tamil Nadu, India, dedicated to its motto of "Reaching the Unreached" across the four southernmost districts. Established in 1990 and recognized by the UGC with a NAAC 'A' grade, the university operates from a sprawling 550-acre main campus, serving approximately 104 affiliated colleges. The university offers a robust academic environment through its 24 diverse departments, encompassing arts, sciences, and technology programmes at all academic levels. The university is committed to global engagement and skill development, delivering off-campus and vocational education initiatives. The university provides a wide network and a strong commitment to academic and research collaboration.

Sacred Heart College

Established in 1951 in Tirupattur, Tamil Nadu, Sacred Heart College is administered by the Salesians of Don Bosco and affiliated to the Thiruvalluvar University. Committed to providing higher education rooted in Christian values, the college prioritises access for underprivileged and rural youth. Accredited with A++ grade by NAAC in the fifth cycle, it secured the 47th rank in NIRF 2024. The institution offers undergraduate, postgraduate, and research programmes across Arts, Commerce, Science, Professional, and Social Work, emphasizing integral human development, ethical values, social responsibility and entrepreneurial skills, particularly for the marginalised.

Advisory Committee

RT. REV. DR. S. CHRISTOPHER VIJAYAN
Bishop, CSI Kanyakumari Diocese,
Tamil Nadu, India

RT. REV. DR. V. PATHMATHAYALAN
Bishop, Jaffna Diocese, Jaffna,
Sri Lanka

ER. S. BYJU NIZETH PAAUL
Secretary, CSI Kanyakumari Diocese,
Tamil Nadu, India

REV. DR. PRAVEEN PETER
Secretary, Sacred Heart College
(Autonomous), Tirupattur,
Tamil Nadu, India

PROF. R. RAVIRAJAN
Dean, Faculty of Science, University
of Jaffna, Thirunelvely, Jaffna,
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DR. D. HENRY RAJA
Principal i/c, Scott Christian College
(Autonomous), Nagercoil, Tamil Nadu,
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REV. DR. D. MARIA ANTONY RAJ
Principal, Sacred Heart College
(Autonomous), Tirupattur, Tamil Nadu,
India

REV. DR. G. THEOPHIL ANAND
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Acknowledgement

Sincere thanks go to the Sponsors, Religious Leaders, and the Scientific Community for their contributions and guidance.

We also acknowledge the efforts of the Technical Team, Faculty Members, Scholars, and Students whose participation and commitment are instrumental to the success of the conference.

We give our special appreciation to the funding and the travel agencies for their generous support in facilitating this international gathering.

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PROGRAMME SCHEDULE

09 FEB 2026 ENVIRONMENTAL HEALTH AND RESILIENCE

@ Hoover Auditorium, Faculty of Medicine, University of Jaffna

08:00 a.m.	**Registration**	
08:30 a.m.	**Lighting the Lamp & Prayer**	
08:40 a.m.	**Welcome Address**	**Prof. THULASITHA W. SHANTHAKUMAR** Conference Chair University of Jaffna, Sri Lanka
08:45 a.m.	**Introducing the Conference**	**Dr. M. P. JEYASEKHAR** Conference Chair Scott Christian College (Autonomous), India
08:50 a.m.	**Inaugural Address**	**Prof. S. N. SURENDRAN** Senior Professor (Chair) of Zoology University of Jaffna, Sri Lanka
09:00 a.m.	**Address by the Dean**	**Prof. P. RAVIRAJAN** Faculty of Science University of Jaffna, Sri Lanka
09:05 a.m.	**Address by the Vice Chancellor**	**Prof. S. SRISATKUNARAJAH** Vice Chancellor University of Jaffna, Sri Lanka
09:20 a.m.	**Address by the Bishop, JDCSI**	**Rt. Rev. Dr. V. PATHMATHAYALAN** Bishop, Jaffna Diocese, Sri Lanka
09:30 a.m.	**Address of the Guest of Honour**	**Prof. SEVVANDI JEYACODY** University of Wayamba, Sri Lanka
10:00 a.m.	**Felicitation**	**Rt. Rev. Dr. S. CHRISTOPHER VIJAYAN** Bishop, CSI Kanyakumari Diocese**,** India **Er. S. BYJU NIZETH PAAUL** Secretary, CSI Kanyakumari Diocese, India **Dr. D. HENRY RAJA** Principal i/c Scott Christian College (Autonomous), India
10:10 a.m.	**Releasing the Proceedings**	

10:20 a.m. Group Photo and Tea Break @ Hall – Next to Hoover Auditorium, Faculty of Medicine

10:50 a.m.	**Keynote Address**	**Dr. S. WEJEYAMOHAN** University of Vavuniya, Sri Lanka
11:20 a.m.	**Keynote Address**	**Dr. N. RICHARD KENNEDY** Scientist, Horticulture Research Station, India
11:50 a.m.	**Keynote Address**	**Dr. S. KALIDAS** Head of Animal Science Department Manonmaniam Sundaranar University, India
12:20 p.m.	**Vote of Thanks**	**Dr. S. ARTHIYAN** Organising Secretary, University of Jaffna
12:30 p.m.	**Lunch Break**	@ Hall – Next to Hoover Auditorium, Faculty of Medicine
01:30 p.m.	**Panel Discussion**	**Subject Experts**

PAPER PRESENTATION - SCIENTIFIC SESSIONS

@ Faculty of Science, University of Jaffna

01:30 p.m. – 04:15 p.m.	Language and Literature Environmental Health and Resilience Engineering, Technology and Management Physical and Chemical Sciences Biological Sciences Health Sciences and Nutrition Social Sciences

VALEDICTION

@ Library Auditorium, University of Jaffna

04:20 p.m.	**Welcome Address**	**Dr. D. DANIEL LAWRENCE** Organising Chair Sacred Heart College (Autonomous), India
04:25 p.m.	**Valedictory Address**	**Prof. PRATHEEPARAJAH** Professor of Geography, Faculty of Arts University of Jaffna
04:35 p.m.	**Concluding Remarks**	**Mr. S. GODWIN RAJA** CEO, Azentra Global, India

04:45 p.m.	**Conference Report**	**Dr. S. SHARMILA JULIET** Organising Secretary Scott Christian College (Autonomous), India
04:55 p.m.	**Conference Minutes**	**Dr. ABYERAMI SIVARUBAN** Programme Convenor University of Jaffna, Sri Lanka
05:00 p.m.	**Feedback**	**Prof. S. KANNATHASAN** Faculty of Medicine, University of Jaffna, Sri Lanka
05:10 p.m.	**Awards**	**Ms. R. NITHYAGOWRY** Registration Convenor University of Jaffna, Sri Lanka
05:20 p.m.	**Certificates**	**Dr. C.V. BRIGET ANITHA** Organising Secretary Scott Christian College (Autonomous), India
05:30 p.m.	**Vote of Thanks**	**Dr. G. ANISH S. GEORSHIA** Organising Secretary Scott Christian College (Autonomous), India

10 Feb 2026 TRACING EARTH'S QUIET STORIES

@ The Palmyrah Research Institute, Jaffna

09:30 a.m.	**Welcome Address**	**Dr. B. S. BENILA** Promotion Convenor Scott Christian College (Autonomous), India
09:40 a.m.	**Felicitation**	**Dr. A. DHAYAL RAJ** Steering Committee Member Sacred Heart College (Autonomous), India
10:00 a.m.	**Keynote Address**	**Mr. S. SRIVIJEINDRAN** General Manager The Palmyrah Research Institute, Jaffna
10:30 a.m.	**Paper Presentation**	Virtual Interaction

01.00 p.m.	**Lunch Break**	
01:30 p.m.	**Keynote Address** **Online**	**Dr. M. CHITHIRAI PON SELVAN** Research Director and Head School of Science and Engineering Curtin University, Dubai
01:50 p.m.	**Vote of Thanks** **Online**	**Dr. Y. PREMILA RACHELIN** Steering Committee Member Scott Christian College (Autonomous), India

11 FEB 2026 WHISPERS OF PRESERVATION

@ The Elephant Orphanage, Pinnawala

09:00 a.m.	**Welcome Address**	**Dr. R. NIRMALA DEVI** Associate Professor Avinashilingam Institute of Home Science & Higher Education for Women, India
09:10 a.m.	**Felicitation**	**Dr. M. SENTHIL KUMAR** Associate Professor of Applied Physics Joy University, India
09:30 a.m.	**Keynote Address**	**Mr. MIHIRAN MEDAWALA** Deputy Director The Elephant Orphanage, Pinnawala
10:00 a.m.	**Paper Presentation**	Virtual Interaction
01:00 p.m.	**Lunch Break**	
01:30 p.m.	**Keynote Address** **Online**	**Dr. S. SHOBANA** Senior Scientist and Head, Diabetes Food Technology Madras Diabetes Research Foundation, India
01:50 p.m.	**Vote of Thanks** **Online**	**Dr. V. ANSLIN FERBY** Publication Convenor Scott Christian College (Autonomous), India

12 FEB 2026 ECHOES PRESERVED IN SILENCE

@ The National Museum, Colombo

10:00 a.m.	**Welcome Address**	**Dr. KAVITHA** Associate Professor Avinashilingam Institute of Home Science and Higher Education for Women, India
10:10 a.m.	**Felicitation**	**Rev. Dr. S. BHARATHI BERNADSHA** Faculty of Physics Sacred Heart College (Autonomous), India
10:30 a.m.	**Keynote Address**	**Mrs. SANUJA KASTHURIARACHCHI** Director General National Museum, Colombo
11:00 a.m.	**Vote of Thanks**	**Dr. SWEETLYN MOSES** Associate Professor and Head Department of English Women's Christian College (Autonomous), India
11:15 a.m.	**Concluding Remarks**	**Dr. S. GODWIN WESLEY** Principal Scientist Scott Christian College (Autonomous), India

--Sustainable actions today will define the environmental legacy of tomorrow--

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BIOLOGICAL-SCIENCE | **IC26/351**

DEVELOPMENT OF SAPROZOIC WORM CONSORTIA FOR ENHANCED MICROPLASTIC MINERALIZATION

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Abstract

Plastic pollution represents a critical environmental challenge, necessitating innovative bioremediation strategies. Recent research indicates that certain saprozoic worm (super worms) can digest microplastics (MPs), largely facilitated by adaptive gut microbiomes. However, the specific mechanisms, microbial dynamics, and long-term fate of plastics within these systems remain poorly elucidated. Furthermore, while microbial consortia for plastic degradation have been explored, the potential of engineered worm consortia for efficient MPs mineralization is an uncharted avenue. Current knowledge lacks a clear understanding of the specific bacterial species and enzymes involved in breaking down different plastics. The complete chemical pathway from plastic to final safe byproducts is also not mapped. Crucially, the long-term health effects on worms and the stability of their microbial partners during continuous plastic consumption are unknown. Therefore, our laboratory is systematically working to address these gaps. We are working to identify the key MPs-degrading microbes and enzymes within worm guts, trace the full breakdown pathway to confirm complete and safe mineralization and study the long-term health and gut ecology of worms on a MPs-diet. Filling these knowledge gaps is essential to move from a promising laboratory discovery to designing effective "worm consortia" for real-world use, which could offer a dual-benefit solution aligned with environmental and agricultural goals. Our research aims to develop engineered saprozoic worm consortia, representing a promising frontier in the move from biological curiosity to functional environmental biotechnology.

Keywords

Microplastic bioremediation; Saprozoic worms; Gut microbiome; Plastic-degrading enzymes; Engineered microbial–worm consortia

BIOLOGICAL-SCIENCE | **IC26/094**

BREEDING BEHAVIOR OF THE BLACK WINGED STILT (*HIMANTOPUS HIMANTOPU*S) AT PUTHALAM SALT PAN

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Abstract

The present study examines the diversity and breeding behaviour of the Black-winged Stilt (Himantopus himantopus) in the Puthalam Salt Pan, located in the Kanyakumari District of Tamil Nadu. Field surveys were conducted from January to October 2025 to document monthly population changes and assess how environmental factors such as temperature, rainfall, water depth, salinity, and food availability influenced the species' distribution. The Black-winged Stilt exhibited considerable ecological adaptability, with population numbers fluctuating throughout the study period. Peak abundance was recorded during the post-monsoon season, with the highest count of 159 individuals documented in September.

Breeding activities occurred predominantly between April and August. Nests were constructed on mudflats, bunds, and shallow water edges, demonstrating the species' flexible nesting behaviour. Clutch size varied from 1 to 4, and both male and female parents participated in incubation as well as chick-rearing. Breeding was influenced by several factors, including habitat disturbance, predation pressure, and variations in water levels.

Overall, the study underscores the ecological importance of the Puthalam Salt Pan as a critical habitat that supports both feeding and breeding activities of shorebirds, particularly the Black-winged Stilt. The findings highlight the need for targeted, habitat-based conservation measures to protect the avifaunal diversity of the region. Ensuring sustainable management of this wetland is essential for maintaining ecological balance and supporting the long-term survival of Black-winged Stilt.

Keywords

Black-winged Stilt; Breeding Behaviour; Puthalam Salt Pan; Shorebird Conservation; Habitat Ecology

BIOLOGICAL-SCIENCE | **IC26/143**

EFFECT OF LAND-USE SYSTEMS ON PHYSICO CHEMICAL PROPERTIES OF THE SOIL FROM VAVUNIYA DISTRICT

A. Murugesapillai, S. Dilaxsika, K. Kajeevan, A. Shayanthan, N. Gnanavelrajah and V. Kirushnarajah

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Abstract

Land degradation is the major threat which leads to decline in soil fertility and other challenges to the Sri Lanka's dry zone agriculture. The effective land use system is one of the ways to improve and restore soil fertility. In this background, this study aimed to evaluate the effects of six land use systems: permaculture, organic, inorganic, integrated, forest, and bare land; physical and chemical soil properties; to identify effective management strategies. Soil samples were collected from six lands uses in Vavuniya District at two depths (0 - 15 cm and 15 - 30 cm) and analysed for physical parameters (texture, bulk density, porosity, and dry aggregate stability) and chemical characteristics (pH, EC, CEC, available N, P, K, total organic carbon, and soil colour). The treatments were arranged in complete randomized design with three replicates and statistical analysis was done by using ANOVA (SAS 9.4) at a 0.05 significance level. The results revealed significant variations across land-use systems and depths. Forest and permaculture soils exhibited significantly improved properties, low bulk density (1.55–1.56 g/cm³), high porosity (>50%), high CEC (>25 cmol+/kg), and greater total organic carbon (2.46%). In contrast, inorganic and bare lands showed higher compaction (1.64–1.67 g/cm³), reduced porosity, and nutrient depletion. Organic and integrated systems demonstrated moderate improvements, suggesting their potential in rehabilitating degraded soils. These findings emphasize that land-use type profoundly influences physical and chemical properties of the soil. Further studies are needed to document the effect on biological indicators of the soil and the potential of carbon sequestration.

Keywords

Land degradation; Land use system; Soil fertility; Permaculture; Sustainable agriculture

BIOLOGICAL-SCIENCE | **IC26/184**

IMPACT OF DIFFERENT APPLICATION METHODS OF *AZOLLA FILICULOIDES* ON GROWTH AND YIELD PERFORMANCE OF RICE

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Abstract

Rice is the staple food of Sri Lanka, yet synthetic over-fertilization in the Dry Zone has caused soil degradation, pollution, and health crises like CKDu while increasing costs. Azolla, a nitrogen-fixing aquatic fern, provides a sustainable alternative by enhancing soil fertility and partially substituting chemical fertilizers, yet its effectiveness under integrated nutrient management (IPNM) needs evaluation. A field experiment was conducted at the Mahilankadu located in Kilinochchi district, to study the impact of different application methods of *Azolla filiculoides* on growth and yield performance of rice during the season of yala 2025. Eight different Azolla application treatments such as, DOA recommended fertilizer (T1), Azolla as companion crop only (T2), Azolla as green manure (T3), Azolla as dry manure (T4), Azolla + basal (T5), Azolla + basal + 1st top dressing (T6), Azolla + basal + 1st & 2nd top dressings (T7) and Azolla + basal + first three top dressings(T8) were tested in randomized complete block design with four replicates. Size of each plot was 6 m x 3 m and same weight seeds were broadcasted by hand. Green and dry Azolla manure was incorporated 2 weeks prior to puddling, and a companion crop of Azolla was established one week after broadcasting. The soil properties, plant growth, yield components, production cost were recorded. The data were analysed by using SAS 9.1 package. DMRT was done to identify the best treatment. Grain yields of the T1, recommended fertilizer treatment (5.34 t/ha) and T8, Azolla + basal + first three top dressings with omitting the last top dressing representing 15.5 percent of the total Urea requirement (5.33 t/ha) were statistically comparable, T8 is identified as the most effective and sustainable treatment for rice cultivation in the dry zone of Sri Lanka, ensuring high productivity, enhanced soil fertility, and superior cost-efficiency.

Keywords

Azolla; Fertilizer; Food security; Integrated plant nutrient management; Soil fertility

BIOLOGICAL-SCIENCE | **IC26/135**

COMPARATIVE HEMOLYTIC AND ENZYMATIC POTENCY OF CRUDE TENTACULAR VENOMS FROM THREE SCYPHOZOAN JELLYFISH SPECIES

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Abstract

Hemolytic activity is widely used as a primary indicator of cnidarian venom toxicity, yet Sri Lankan jellyfish venom potency is comparatively understudied despite their direct involvement in human stings and the rising frequency of jellyfish blooms. Although hemolysis is typically associated with localized skin reactions, it can occasionally lead to severe systemic effects and is thought to be mediated largely by peptide based and membrane active toxins while the exact molecules responsible remain poorly characterized. This study presents a comparative evaluation of hemolytic and phospholipase A (PLA) activities in crude tentacular venoms of three scyphozoan jellyfish, *Mastigias papua, Rhizostoma octopus,* and *Lobonemoides robustus* collected from the coastal waters of Jaffna Peninsula, Sri Lanka. Crude extracts were prepared using standardized cold autolysis and centrifugation procedures. In vitro hemolytic assay to evaluate membrane disruptive activity using human erythrocytes was quantified using a microplate spectrophotometry and photomicrography to examine morphological alterations in erythrocytes. Hemolysis is often incorporated by an enzymatic phospholipase A activity and was performed by measuring the time required for visible coagulation of egg yolk phospholipids following venom exposure. All three species showed dose dependent erythrocyte lysis, with *L. robustus* (94.39% at 60 ppm) exhibiting the strongest hemolytic response, followed by *R. octopus* (14.49% at 20 ppm) and *M. papua* (maximum 10.24% at 50 ppm) at their tested concentration. Notably, PLA activity absent in the other species was detected exclusively in *L. robustus* with the coagulation time of 01 minute and 59 seconds, suggesting a functional link between phospholipid hydrolysis and enhanced membrane disruptive potency. Microscopic observations revealed characteristic erythrocyte deformities confirming membrane destabilization as the primary mechanism. Overall, the findings suggest clear interspecific variation in hemolytic potency and provide essential baseline data relevant to clinical management of jellyfish stings and future biochemical characterization of jellyfish hemolysins and PLA dependent mechanisms.

Keywords

Hemolysis; Erythrocytes; Envenomation; Phospholipase A; Scyphozoa

BIOLOGICAL-SCIENCE | **IC26/221**

ECO-FRIENDLY MANAGEMENT OF *CALLOSOBRUCHUS CHINENSIS* IN STORED COWPEA USING *CARICA PAPAYA* POWDERS FOR PROGENY SUPPRESSION

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Abstract

Stored cowpea is highly susceptible to infestation by the pulse beetle, *Callosobruchus chinensis* (L.).The extensive use of synthetic insecticides has raised serious concerns regarding food safety, human health, and environmental sustainability, leading to the search for plant-based products as eco-friendly alternatives for the management of stored-grain pests. In this context, the present study evaluated on the efficacy of *Carica papaya* leaf, seed, ripe peel, and raw peel powders on oviposition, egg mortality and adult emergence of *C. chinensis* under laboratory conditions. Pest-free cowpea seeds (10 g) were treated separately with five dosages (0.1g, 0.25g, 0.5g, 0.75g and 1.0 g) of each plant powder, and a mated pair of 1–3 day old adults was introduced into each treatment. Three replicates were maintained along with an untreated control. Adult beetles were removed after seven days, and oviposition and egg mortality were recorded, while adult emergence and developmental period were assessed after 21 days. All *C. papaya* powders significantly reduced oviposition, egg hatchability, and adult emergence compared with the untreated control ($p < 0.05$). Among the plant parts tested, effectiveness followed the order: seed powder = leaf powder > ripe peel powder > raw peel powder. Seed powder was the most effective treatment, completely suppressing adult emergence at 0.75 and 1.0 g doses. Egg mortality increased in a dose-dependent manner, particularly with seed and raw peel powders, while higher doses of seed and leaf powders significantly prolonged developmental periods. These findings indicate that *C. papaya* powders, especially seed and leaf powders applied at 0.75–1.0 g per 10 g of seeds, offer a promising eco-friendly approach for the sustainable management of *C. chinensis* in stored cowpea.

Keywords

Callosobruchus chinensis; Carica papaya; Oviposition inhibition; Adult emergence; Egg mortality

BIOLOGICAL-SCIENCE | **IC26/226**

BUTTERFLY DIVERSITY (ORDER: LEPIDOPTERA), DISTRIBUTION AND HABITAT ASSOCIATIONS IN JAFFNA, SRI LANKA

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Abstract

Butterflies (Order: Lepidoptera) are important ecological indicators due to their sensitivity to habitat quality and environmental variables. Sri Lanka harbours 248 recorded butterfly species belonging to six families, including 31 endemic species. Butterfly diversity and distribution are strongly influenced by habitat type and abiotic factors such as temperature, rainfall, humidity, and wind.

This study quantitatively assessed butterfly diversity, distribution, and habitat relationships in Jaffna Sri Lanka, from November 2022 to September 2023. Surveys were conducted at nine sites representing six ecosystem types: home gardens, vegetable gardens, paddy fields, undisturbed lands, coastal habitats, and mangrove areas. Sampling was carried out twice weekly using sweep netting and hand collection. Larval stages were reared in the laboratory to confirm species identification.

A total of 264 individuals comprising 47 species from five families: Papilionidae, Pieridae, Nymphalidae, Lycaenidae, and Hesperiidae were recorded. Lycaenidae was the most species-rich family, accounting for 15 species (31.9%), followed by Nymphalidae (12 species, 25.5%) and Pieridae (10 species, 21.3%). Papilionidae and Hesperiidae each contributed five species (10.6% each). Undisturbed habitats supported the highest species richness and abundance, contributing more than 40% of the total species recorded, whereas coastal and mangrove habitats showed comparatively lower diversity. Flowering plant species such as *Lantana camara* and *Calotropis gigantea* were dominant in undisturbed areas, while *Tridax procumbens* and *Heliotropium indicum* were visited by over 60% of the recorded butterfly species.

The results demonstrate clear quantitative differences in butterfly assemblages among habitat types and emphasize the importance of undisturbed habitats and nectar-rich plant species in maintaining butterfly diversity in the Jaffna region.

Keywords

Undisturbed habitat; Butterflies; Jaffna; Lepidoptera; Butterfly diversity

BIOLOGICAL-SCIENCE | **IC26/228**

PHYTOCHEMICAL COMPOSITION, IN-VITRO ANTIOXIDANT AND ANTIMICROBIAL POTENTIAL OF MARINE MACRO ALGAE (*ULVA* AND *SARGASSUM*)

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Abstract

Marine macroalgae are recognized as rich sources of bioactive compounds with considerable therapeutic potential. Among them, *Ulva* (green alga) and *Sargassum* (brown alga) are widely used in traditional medicine and modern biotechnological applications due to their diverse phytochemical composition. The present study aimed to evaluate the phytochemical profile, in-vitro antioxidant activity, and antimicrobial potential of *Ulva fasciata* and *Sargassum ilicifolium* collected from the coastal region of Northern Sri Lanka.

Dried algal samples were extracted using ethanol, acetone, petroleum ether, and distilled water by maceration. Qualitative and quantitative phytochemical analyses were conducted using standard protocols. Preliminary screening revealed the presence of flavonoids, phenols, alkaloids, tannins, saponins, terpenoids, steroids, coumarins, and cardiac glycosides in all extracts, with variations depending on the solvent used. Quantitative analysis showed marked differences between the two species. The petroleum ether extract of *S. ilicifolium* exhibited the highest flavonoid content (1.495 ± 0.28 µg QE/g) and cardiac glycoside concentration (16.097 ± 0.379 mg/g), while it's aqueous extract contained the highest tannin content (297.4 ± 57.6 µg TAE/g). In contrast, *U. fasciata* showed the highest phenolic content (0.4965 µg GAE/g) in its aqueous extract.

Antioxidant activity assessed using DPPH and ABTS assays indicated that the ethanolic extract of *S. ilicifolium* possessed significantly stronger free radical scavenging activity, with lower LC50 values compared to *U. fasciata*. Antimicrobial activity evaluated by the agar well diffusion method demonstrated that *S. ilicifolium* extracts exhibited greater antibacterial and antifungal efficacy against tested bacterial (*Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*) and fungal (*Aspergillus, Fusarium*, *Mucor*) strains.

Overall, the study confirms that *Sargassum* ilicifolium exhibits superior antioxidant and antimicrobial properties compared to *Ulva* fasciata, highlighting marine macroalgae as promising sustainable sources of natural bioactive compounds for pharmaceutical and nutraceutical applications.

Keywords

Antimicrobial; Antioxidant; Marine macroalgae; Phytochemicals; Sargassum

BIOLOGICAL-SCIENCE | **IC26/201**

FIRST SRI LANKAN RECORD OF PARASITOID *APROSTOCETUS* SP. (HYMENOPTERA: EULOPHIDAE) ASSOCIATED WITH ERYTHRINA GALL WASP

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Abstract

Gall forming insects play a significant role in plant- insect interactions, influencing both the morphology and ecology of their host plants, *Quadrastichus erythrinae* Kim. (Hymenoptera: Eulophidae) – a gall wasp has been reported from many tropical and subtropical countries. Heavy gall infestations by this wasp cause severe deformation of leaves and young stems, weaken trees, stunt growth, and may ultimately lead to the death of *Erythrina* spp. The species was first described in 2006 by Prathaban based on specimens reared from leaf and stem galls on *Erythrina variegata* in Sri Lanka, a plant of considerable traditional and cultural importance. Despite several management strategies implemented to control gall infestation, none have proven effective, and *E. variegata* is gradually declining in natural habitats. Although some commercial plantations maintain gall-free trees through intensive insecticide application, such practices are not environmentally sustainable. To explore sustainable management options, this study investigated the ecology of gall-forming insects associated with *E. variegata* across the Northern Province of Sri Lanka. A comprehensive survey of galls from home gardens at 27 locations identified *Q. erythrinae* as the primary gall inducer. In addition, a parasitoid, *Aprostocetus* sp. (Hymenoptera: Eulophidae), was recorded from selected galls. In the present study, the parasitoid was recorded from all districts of the Northern Province; however, the observed parasitism rate was low (15%). The genus *Aprostocetus* was first described in 1833 and currently comprises more than 800 described species. Many *Aprostocetus* species are primary parasitoids of gall-forming insects, and have been reported from India, Taiwan, and China, while a few are known to attack brown planthoppers. This study represents the first record of a parasitoid associated with gall-forming insects on *E. variegata* in Sri Lanka and highlights its ecological significance and potential role in developing sustainable pest management strategies in tropical ecosystems.

Keywords

Gall forming insects; Erythrina varigata; Quadrastichus erythrinae Kim; Parasitoid; Aprostocetus sp

BIOLOGICAL-SCIENCE | **IC26/187**

FINFISH COMPOSITION ALONG THE COAST OF JAFFNA LAGOON

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Abstract

Jaffna lagoon is the longest lagoon of the country that initiates from Ponnalai in the Jaffna district and extends upto the Kilinochchi district. The objective of the study is to document the fin fish composition and their status. The study was undertaken along the coast of Jaffna lagoon, where fishing activities were done. Fish samples were collected from the whole length of the Jaffna lagoon in 15 landing sites from June 2014 to February 2015. Each landing site was visited 5 times and, the fishes were collected. Catches only from the wing nets were considered for the study to ensure the lagoon inhabitants. The collected fish were placed in a box with crushed ice and brought to the laboratory of the department of Zoology, University of Jaffna, where they were freezed, identified and preserved with standard procedures. During each visit, the number of each species was also counted and an *in-situ* photographic record was also made. Finally, the species status was determined from the data. The present study documented 100 species under 46 families. Six species were categorized as common, those were *Gerres abbreviates, G,oblongus (Gerreidae); Hemirhamphusarchipelagicus (Hemiramphidae); Lutjanusjohnii (Lutjanidae); Strongylura strongylura (Belonidae) and Siganuscannaliculatus (Siganidae).* Thirty nine species categorized as moderate, and fifty five species are rare. Highest species richness was observed in Passayor and the lowest value was observed in Ponnalai. A long term study of the biodiversity of fish species in the entire Jaffna lagoon should be carried out to ensure the spatial and seasonal variation and distribution pattern. This will be helpful in determining the productivity of the Jaffna lagoon and the variation in species composition due to the infrastructure developments and other impacts. The final support of MFF/127 of the ICN grant is gratefully acknowledged.

Keywords

Jaffna lagoon; Species composition; Status; Spatial and temporal variation; Species richness; Status

BIOLOGICAL-SCIENCE | **IC26/210**

DISTRIBUTION, HABITAT, AND LIFE HISTORY OF THE ENDEMIC SILK MOTH *ANTHERAEA CINGALESA* MOORE, 1883(LEPIDOPTERA: SATURNIIDAE)

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Abstract

Antheraeacingalesa Moore, 1883, commonly known as the Sri Lankan tussar silk moth, is an endemic saturniid moth of Sri Lanka, for which information on distribution and biology remains limited. Saturniid moths play important ecological roles as herbivores, prey for higher trophic levels, and indicators of forest health. Several species of the genus *Antheraea*, including *A. mylitta* (India), *A. yamamai* (Japan), and *A. pernyi* (China), are commercially exploited for silk production, highlighting the potential economic importance of *A. cingalesa*. To assess its natural prevalence in the Jaffna Peninsula, periodic field surveys were conducted from January to November 2025 in twelve locations selected based on the presence of reported host plants. Surveys were carried out twice weekly between 06 and 12 hrs. All life stages from eggs, larvae, cocoons, and adults were recorded, with minimal sampling using hand collection and aerial nets. Environmental parameters, including GPS location, temperature, and relative humidity, were recorded at each site. Collected specimens were reared under laboratory conditions (25–28 °C; 70–80 % RH) to confirm species identity and document developmental stages. Life stages of A. cingalesa were observed in seven out of the twelve locations surveyed; namely Sangaraththai, Arali, Kaithady, Navatkuli, Kopay, Mandaithevu and Thirunelvely. Among the reported host plants, *Terminalia arjuna* and *T. catappa* were confirmed as larval hosts, with early instars feeding on tender leaf margins and later instars on mature leaves. Voucher specimens were deposited in the Insect Museum of the University of Jaffna. This study provides baseline information on the distribution, life history, and host plant associations with this endemic wild silk moth, which will support to the future conservation and research efforts.

Keywords

Antheraea cingalesa; Endemic moth; Wild silk moth; Distribution; Life history

BIOLOGICAL-SCIENCE | **IC26/204**

SPECIES COMPOSITION OF DAMSELFLIES (ODONATA: ZYGOPTERA) AND THEIR HABITAT PREFERENCES IN JAFFNA DISTRICT, SRI LANKA

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Abstract

Damselflies (Odonata: Zygoptera) are widely recognized as sensitive bio indicators of freshwater ecosystem health; however, their diversity and distribution in Northern Sri Lanka remain poorly documented. This study presents the first survey of damselfly fauna in the Jaffna District. Field surveys were conducted from January to November 2025 at 13 sites representing diverse aquatic habitats, including ponds, paddy fields, wetlands, mangroves, lagoons, and irrigation canals. A total of 70 individuals were collected using standard entomological techniques, and key environmental parameters such as pH, temperature, dissolved oxygen, and salinity were recorded at each site. Seven species belonging to two families were documented, they are; six species of *Coenagrionidae* namely, *Ischnura senegalensis, I. aurora, Agriocnemis pygmaea, A. femina, Ceriagrion coromandelianum, and Pseudagrion microcephalum* and one species of *Lestidae, Lestes elatus*. All recorded species were previously known from Sri Lanka. *Ischnura senegalensis* was the most abundant and widely distributed species (n = 25; 35.7%), exhibiting remarkable tolerance to degraded water conditions, including high pH (up to 10.26), elevated salinity (up to 1.68 PSU), and low dissolved oxygen levels (as low as 2.76 ppm). Species richness was highest in pond ecosystems, while certain taxa showed habitat specificity, with *C. coromandelianum* predominantly associated with relatively undisturbed habitats. Some behavioural observations included predation by dragonflies on damselflies and post-mating sexual cannibalism in *I. senegalensis* also recorded. This study provides essential baseline data on damselfly diversity and habitat associations in Northern Sri Lanka and highlights the persistence of damselfly composition after post-war development pressures and their values as bio indicators for future freshwater biodiversity conservation and ecosystem monitoring.

Keywords

Damselflies; Biodiversity; Jaffna; Srilanka; Aquatic ecosystems

BIOLOGICAL-SCIENCE | **IC26/203**

BIOPESTICIDAL EFFECT OF AQUEOUS LEAF EXTRACT OF *CARICA PAPAYA* (L.) AGAINST LARVAE OF *PLUTELLA XYLOSTELLA* (L.)

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Abstract

The diamondback moth, *Plutella xylostella* (L.), is a destructive pest of cruciferous crops, and its management using eco-friendly botanical insecticides has gained increasing attention. The present study evaluated the larvicidal efficacy of an aqueous leaf extract of *Carica papaya* against *P. xylostella* under laboratory conditions. Aqueous leaf extract at 0.1g/ml, 0.3g/ml, 0.5g/ml, 0.7g/ml and 0.9 g/ml were tested against third instar larva of *P.xylostella* by using leaf- dip bio assay. Six larvae were exposed per cabbage leaf disc (8 cm diameter) treated with leaf extracts along with water control. The number of dead larva was recorded after 24 h, 48 h and 72 h of exposure. The results revealed a clear concentration and time dependent increase in larval mortality. At the highest concentration (0.9 g/ml), mortality reached 41.67%, 58.33%, and 72.28% at 24 h, 48 h, and 72 h respectively, whereas the control treatment exhibited negligible mortality throughout the experimental period.

Significant larval mortality was observed as follows, 0.9g/ml>0.7g/ml=0.5g/ml>0.3g/ml>0.1g/ml> control. The LD_{50} values decreased progressively with increasing exposure time, indicating enhanced toxic effects of the extract upon prolonged contact. LD_{50} values after 48 h and 72 h was found as 0.7g/ml and 0.54g/ml respectively. The results revealed that aqueous leaf extract of *C. papaya* possesses significant larvicidal efficacy against *P. xylostella* and could be developed as a safe, plant-based alternative to synthetic insecticides. Its incorporation into integrated pest management programs may contribute to sustainable control of *P.xylostella* while reducing environmental and health risks.

Keywords

Keywords: Diamondback moth; Plutella xylostella; Carica papaya; Larval mortality; Leaf-dip bioassay

BIOLOGICAL-SCIENCE | **IC26/229**

A PRELIMINARY STUDY ON ANT DIVERSITY IN SELECTED ECOSYSTEMS OF CHUNNAKAM, JAFFNA DISTRICT, SRI LANKA

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Abstract

Ants (Hymenoptera: Formicidae) are widely distributed social insects and effective bioindicators due to their sensitivity to environmental change, contamination, and habitat disturbance. This study aimed to document ant species composition, across different ecosystems in Chunnakam, an area historically affected by environmental contamination from long-term fossil fuel power generation.

Field surveys were conducted from February to March 2025 at four sites in Chunnakam representing distinct habitat types: organic farmland, conventional farmland, abandoned land, and wetland. Ant sampling was carried out fortnightly during morning hours (06:00–08:30 h) using baited pitfall traps and quadrat sampling for soil-dwelling ants, and hanging baited traps for arboreal ants. Environmental parameters including air and soil temperature, humidity, and rainfall were recorded at each site.

A total of 11 ant species belonging to 8 genera and 4 subfamilies were recorded. The subfamily Formicinae was the most dominant, represented by *Camponotus compressus, Camponotus spp., Polyrhachis sp., Oecophylla smaragdina* and *Paratrechina longicornis.* Myrmicinae included *Myrmicaria brunnea, Solenopsis geminata,* and *Crematogaster sp., while Diacamma rugosum* (Ponerinae) and *Tetraponera rufonigra* (Pseudomyrmecinae) were also identified. Species richness varied among habitats, with the abandoned land showing the highest diversity (9 species), followed by organic farmland (7 species), wetland (6 species), and conventional farmland (3 species). These results indicate that ant community structure in Chunnakam is strongly influenced by habitat type and site-specific environmental conditions, highlighting the value of ants as indicators of ecological disturbance.

Keywords

Ant diversity; Formicidae; Ecosystem variation; bioindicators; Chunnakam, Sri Lanka

BIOLOGICAL-SCIENCE | **IC26/234**

A PRELIMINARY STUDY OF ESTABLISHMENT OF MIDGUT CELL LINE BY USING *AEDES AEGYPTI* LARVA

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Abstract

Arbovirus diseases transmitted by *Aedes aegypti* have become a serious challenge for public health, in tropical and subtropical regions. Arboviruses need to effectively infect and replicate in midgut epithelial tissues prior to reaching secondary target tissues, after infected blood feeding. In the present study, a primary culture cell line was established using midguts derived from *Aedes aegypti* L3 or L4 instars of larvae. Fresh water *Aedes aegypti* eggs were collected from the pure colony maintained by Department of Zoology and reared under SOP conditions. Midguts (20) were dissected under aseptic conditions and minced with the presence of PBS (1x) under the laminar floor hood. Minced tissue parts were allowed in the collagenase type I (1 ml, 0.1% w/v) for 20 minutes for chemical digestion. Digestion was stopped by adding 1 ml of PBS and filtered through 100µm Nylone filter. Filtrate was centrifuged at 1000 x g for 10 minutes. Cells were resuspended in 3 ml of pre prepared Grace's culture media (4.59 g of Grace's powder, 0.035g of $NaHCO_3$, 1 ml of FBS (1%), 20 µl of antibiotic (nystatin)stock solution (5000U/ml),98.98 ml distilled water) under sterile conditions. Seeded on the cell culture petri dishes and incubated at 26 º C. After every 24 hours culture media was replaced. Total number of viable cells were counted with the support of hemocytometer with trypan blue 0.4%w/v). Growing culture was observed under inverted phase contrast microscope. Double staining procedure was followed to characterized cells. Within 144 hours post-incubation, cells grown in culture formed a confluent monolayer. Different type of cell population was observed constituting with majority of small round to oval cells. This study successfully established in vitro model and highlights the importance of immunohistochemical characterization for validating cell identity.

Keywords

Aedes aegypti; Midgut cells; Collagenase; PBS; Grace's culture media;

BIOLOGICAL-SCIENCE | **IC26/231**

ATTRACTIVENESS OF LOW-COST, LOCALLY DERIVED FERMENTED ORGANIC INFUSIONS TO GRAVID AEDES AEGYPTI UNDER LABORATORY CONDITIONS

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Abstract

Primary vectors of dengue are female *Aedes aegypti* mosquitoes. Understanding the substrate preferences of gravid *Aedes aegypti* is essential for developing affordable and effective dengue vector control tools. This laboratory study evaluated the attractiveness of five fermented organic infusions prepared from low-cost, locally available materials: dehydrated red banana (*Musa acuminata*) peel powder (RBPP), raw cambium of cashew (*Anacardium occidentale*) bark (RCB), brown cashew gum (BCG), a formulated powder (FP), and a sugar–yeast–straw (SYS) mixture consisting of 0.750 g sugar, variable doses of baker's yeast, and 0.250 g rice (*Oryza sativa*) straw. Each infusion was prepared by mixing graded doses (0.010, 0.025, 0.100, 0.300, and 0.500 g) with 250 mL of tap water and fermenting for 24 h at room temperature. Seven-day-old gravid *Aedes aegypti*, fully engorged at 5 days old, were released in groups of 15 into a linear dual-choice olfactometer, with each infusion dose tested against 250 mL of tap water alone. Attracted females were recorded after 24 h. From triplicate data, doses showing a positive preference index and the lowest P-value were selected and compared with the best-performing SYS dose. Preference indices (%) were calculated in Excel 2016, and P-values were determined using paired Student's t-tests in Prism v10, with significance set at $P < 0.05$. Gravid attraction was varied by infusion type and dose. Significant attraction was observed at 0.500 g RBPP (60.0 ± 13.3%), 0.300 g RCB (42.2 ± 15.4%), 0.500 g BCG (42.2 ± 7.7%), 0.025 g FP (64.4 ± 7.7%), and 0.025 g SYS (37.8 ± 20.4%). Among treatments, 0.500 g BCG elicited the highest attraction and significantly outperformed SYS containing 0.025 g yeast (82.1 ± 7.9%, $P = 0.003$). These findings identify brown cashew gum as a novel, low-cost, promising attractant for gravid Aedes aegypti, supporting lure optimization and field validation.

Keywords

Gravid Aedes aegypti; Attractants; Fermented organic infusions; Vector control; Olfactometer assay

BIOLOGICAL-SCIENCE | **IC26/185**

DIVERSITY OF JELLYFISH SPECIES IN THE COASTAL WATERS OF JAFFNA PENINSULA, SRI LANKA

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Abstract

Jellyfish blooms in the Jaffna Peninsula have recently disrupted human activities, damaging fishing nets and posing stinging risks. But, they have potential value in biotechnology, especially due to their bioactive compounds. However, knowledge about jellyfish species in Sri Lankan waters, particularly along the northern coast, is still limited, with only a few recent studies available. The present study was carried out to identify the jellyfish species occurring in the coastal waters of Jaffna Peninsula at thirteen different locations from November 2023 to October 2025. Using hand nets and traditional fishing gear from a motor boat, 11 jellyfish species representing 10 genera, 7 families, and 2 orders were collected. The jellyfish were identified based on morphological characteristics including the microscopic analysis of nematocyst from the toxigenic tissues and described in detail using standard taxonomic methods. These included *Cassiopea andromeda, Mastigias papua, Phyllorhiza punctata, Acromitus flagellatus, Rhopilema hispidum, Lobonemoides robustus, Lobonemoides gracilis, Catostylus perezi, Cyanea* sp.*, Rhizostoma octopus*, and one unidentified species from the family Cepheidae. Among the recorded species, *Lobonemoides robustus, Lobonemoides gracilis, Acromitus flagellatus,* and *Rhopilema hispidum* were documented in this region for the first time, whereas *Mastigias papua, Catostylus perezi, Rhizostoma* octopus, and the unidentified species from the family Cepheidae represent new records for Sri Lanka. Two species remain unidentified and require further morphological and molecular analyses for accurate classification. This study enhances understanding of scyphozoan jellyfish occurrences and establishes essential baseline data for future ecological assessments in conservation, bloom management strategies, potential biotechnological applications of jellyfish resources in northern Sri Lanka.

Keywords

Jellyfish; Scyphozoa; Diversity; Nematocyst; Sri Lanka

BIOLOGICAL-SCIENCE | **IC26/239**

SOME REPRODUCTIVE FACTS OF LAPEMIS CURTUS (SHAW, 1802) DOCUMENTED IN JAFFNA, SRI LANKA

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Abstract

Lapemis curtus (Shaw, 1802) is one of the most abundant fisheries by-catch sea snake species at the Vadamarachchi region of Jaffna. The objective of the study is to find out the reproductive habits of *L. curtus*. The study was under taken along the coastal area of Vadamaratchchy from Valvettithurai to Manalkaddu that covered a length of 17.5 km. Dead and dying sea snakes were collected from December 2011 to November 2012, as the by-catch of fisheries Altogether 58 female snakes were used in this study in which 15 were gravid females. Snout to vent length (SVL) and total length (TL) were taken as 0.1mm, weight (Wt) was measured to the nearest 0.002g and the sex was determined by standard procedures. Gravid females were dissected, measurements of eggs and embryo and the clutch size were recorded. Regression analysis was carried out to find the relationship between SVL and clutch size. Based on the observations, the gestation period, and average clutch size were enumerated. The follicles were observed from November 2011 and fully developed embryos were observed in June 2012. Average clutch size was 5.2. Average length of fully developed embryo was 30cm. Early stages of eggs were completely filled with yolk. Fully developed embryos visible with no yolk in their egg sacs. Additionally, embryos had connected with cord like structure to the anal region. The p-values of regression analysis of number of eggs versus snout-vent length, average egg length versus number of eggs and clutch size versus number of eggs were 0.008, 0.058 and 0.002 respectively. From these we conclude *L. curtus* followed an ovoviviparous reproductive straggly, 8-9 months' gestation time that falls between November to June and the average size at the time of birth of the young is around 30 cm.

Keywords

Sea snakes; Gravid females; Follicle; Gestation period; Ovoviviparous

BIOLOGICAL-SCIENCE | **IC26/246**

EFFECT OF PROBINEB (FUNGICIDE) ON EARLY DEVELOPMENTAL STAGE OF ZEBRAFISH

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Abstract

Zebrafish (*Danio rerio*) embryos are widely used as a sensitive and reliable vertebrate model for assessing developmental toxicity of environmental contaminants. Propineb, a dithiocarbamate fungicide extensively applied in agriculture, has raised concerns due to its potential adverse effects on non-target aquatic organisms. The present study was conducted to evaluate the embryotoxic and developmental effects of propineb on early developmental stages of zebrafish under laboratory conditions. Healthy fertilized zebrafish embryos were obtained through induced spawning and exposed to different concentrations of propineb using a standardized embryo toxicity assay following OECD guidelines. Embryos were exposed to different concentrations of propineb at 6 hours post fertilization (hpf) and observed at 24, 48, 72 and 96 hpf for mortality, hatching success, and morphological abnormalities. Control embryos exhibited normal development with regular heartbeat, proper somite formation, straight body axis, and timely hatching. In contrast, propineb-exposed embryos showed concentration- and time-dependent increases in mortality and developmental deformities, including delayed hatching, pericardial and yolk sac edema, spinal curvature, growth retardation, reduced heart rate, and abnormal swimming behaviour. The median lethal concentration (LC_{50} = 5.0 mg/ L) value at 96 hpf indicated significant toxicity of propineb to zebrafish embryos. The findings of this study demonstrate that propineb can disrupt normal embryonic development and induce severe toxic effects in zebrafish at environmentally relevant concentrations. These results highlight the potential ecological risk posed by propineb contamination in aquatic environments and emphasize the need for careful regulation and further mechanistic studies on its developmental toxicity.

Keywords

Zebrafish; Propineb; Developmental toxicity; Developmental deformities

BIOLOGICAL-SCIENCE | **IC26/258**

PRODUCTION AND OPTIMIZATION OF MICROBIAL EXOPOLYSACCHARIDE FOR BIOLOGICAL APPLICATIONS

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Abstract

Microbial EPS are high-value biopolymers with potential applications in various industries due to their diverse properties. However, achieving enhanced yield and desirable functional characteristics remains a key challenge. This study aims to optimise the production conditions for microbial EPS through statistical design approaches and to characterise the polymer using analytical techniques to understand its structural and thermal properties. The selected bacterial strain was cultivated in a sucrose-based medium under controlled conditions. Initial screening for EPS-producing isolates was performed using the agar plate assay method. Process optimisation was carried out using Plackett–Burman Design (PBD) to identify significant factors influencing EPS yield, followed by Central Composite Design (CCD) for fine-tuning the selected parameters. The EPS was extracted using solvent precipitation for efficient recovery. Structural and thermal characterisation of the purified EPS was performed using Fourier-transform infrared spectroscopy (FTIR) to identify functional groups, thermogravimetric analysis (TGA) to evaluate thermal stability, and X-ray diffraction (XRD) to determine the crystalline nature. Preliminary optimisation revealed sucrose as the most suitable carbon source and tryptone as the preferred nitrogen source for enhanced EPS production. The PBD and CCD analyses demonstrated a significant increase in yield under optimised conditions. FTIR confirmed the presence of characteristic polysaccharide functional groups, while TGA indicated good thermal stability. XRD patterns showed semi-crystalline characteristics typical of microbial EPS. These results provide a foundation for further scale-up and evaluation of the polymer for industrial and biological applications.

Keywords

Exopolysaccharide; PBD; CCD; Precipitation; Characterization

BIOLOGICAL-SCIENCE | **IC26/168**

PREDATORY EFFICIENCY OF DRAGONFLY NYMPHS AGAINST *AEDES AEGYPTI* LARVAE DEVELOPING IN BRACKISH AND FRESHWATER ENVIRONMENTS

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Abstract

The increasing occurrence of *Aedes aegypti* larval development in brackish water (BW) habitats challenges conventional vector control strategies that predominantly targets on freshwater (FW) habitats. In this context, the present investigation evaluated the predatory efficacy of selected dragonfly nymphs capable of developing in both FW and BW environments, with the aim of assessing their suitability as potential biological control agents across FW and BW environments. Nymphs of five dragonfly species collected from FW and BW habitats were acclimatized to FW (<0.5 g L^{-1} salinity) and BW (10 g L^{-1} salinity) mesocosms. The predation experiments were replicated nine times using different individual predators per species under each salinity condition. Predatory rate (PR) and clearance rate (CR) were evaluated at 24, 48, and 72 hours following the introduction of 100 fourth-instar (L4) *Ae. aegypti* larvae from FW and BW laboratory colonies, with larvae replenished every 24 hours. Among the dragonfly species tested, *Hydrobasileus croceus* exhibited significantly higher ($p < 0.05$) PR and CR across all time points in BW mesocosms and at 24 hours in FW mesocosms, whereas *Pantala flavescens* showed significantly higher PR and CR in FW mesocosms at 48 and 72 hours. In contrast, *Crocothemis servilia* consistently demonstrated significantly lower PR and CR across all salinity conditions. Overall, all tested species displayed effective predatory potential, supporting their application as effective biological control agents against immature Ae. aegypti in both freshwater and brackish water habitats.

Keywords

Aedes aegypt; Biological control; Clearing rate; Dragonfly nymphs; Predatory rate

BIOLOGICAL-SCIENCE | **IC26/278**

FIRST RECORD OF THE SEAGRASS HALOPHILA OVALIS AND ENHALUS ACROIDES IN THE COASTAL SHALLOW WATERS OF KOWTHARIMUNAI, POONARY, SRI LANKA: A PRELIMINARY ECOLOGICAL ASSESSMENT

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Abstract

Coastal shallow-water ecosystems are renowned for their biodiversity; comprise of diverse faunal and floral components and are of greater ecological significance. This study confirms the first record of the seagrass *Halophila ovalis* of Family Hydrocharitaceae, in the coastal shallow ecosystem of Kowtharimunai, Poonakary, Northern Province of Sri Lanka. The observation was made during an opportunistic initial discovery, followed by targeted surveys to locate additional patches in the study area. Six field surveys were undertaken periodically from November 2024 to January 2026, alternatively covering the lunar cycles. Species identification was done based on key morphological characteristics including, absence of leaf hairs, paired leaf blades (mean length: 2.3 cm) without serration on tip, attached to the thin rhizome, and distinct reddening along the midrib. H. ovalis was co-occurring with *Enhalus acoroides* which belongs to same family, in the patches not exceeding a 2m2 in the study area. Preliminary ecological assessment revealed a high coverage of filamentous green algal epiphytes on H. ovalis compared to *E. acoroides*, and a higher abundance of epifaunal snails on the lower leaf surfaces of both species. The presence of H. ovalis extends its distribution along the Sri Lankan coastal line and establishes a new baseline for the seagrass flora of the Poonakary region. The observed high epiphyte load suggests the influence of environmental conditions or disturbances and it open the scope for further studies. This discovery indicates the potential for future studies on detailed mapping and the ecology of seagrass meadows in the study area.

Keywords

Epiphytes; First record; Halophila ovalis; Poonakary; Sympatric

BIOLOGICAL-SCIENCE | **IC26/257**

HIDDEN SYMBIOSIS REVEALED: FIRST RECORD OF RICHELIA INTRACELLULARIS IN SRI LANKAN COASTAL WATERS

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Abstract

This study documents the first confirmed occurrence of a diatom–diazotroph association (DDA) involving *Rhizosolenia hebetata* and *Rhizosolenia formosa* hosting the endosymbiotic cyanobacterium Richelia intracellularis in the coastal waters of Northern Sri Lanka. The finding emerged from a year-long investigation of plankton diversity conducted during 2023 along three coastal sites Mathagal, Kankesanthurai (KKS), and Akkarai Beach where monthly plankton samples were collected using a 55 µm mesh plankton net and examined under light microscopy. The DDA was observed exclusively in samples from Mathagal in May and Akkarai in August, with intracellular trichomes of *R. intracellularis* clearly identified within both Rhizosolenia host species at ×400 magnification. This record extends the known geographical distribution of Richelia–Rhizosolenia symbioses, previously reported mainly from the southeastern Arabian Sea and other tropical oligotrophic regions. The occurrence of this association in Sri Lankan coastal waters underscores the ecological significance of DDAs in enhancing nitrogen availability through biological nitrogen fixation, thereby supporting phytoplankton productivity in the nutrient-limited marine environments of the northern Indian Ocean. Given the limited comprehensive studies on diatom diversity and symbiotic associations in Sri Lanka, this finding provides important baseline information for regional plankton ecology. Overall, this first record underscores the ecological relevance of DDAs in Sri Lankan waters and calls attention to their potential influence on coastal productivity and nutrient balance.

Keywords

Richelia intracellularis; Rhizosolenia; Diatom-Diazotroph Association (DDA); Nitrogen fixation; Marine symbiosis

BIOLOGICAL-SCIENCE | **IC26/065**

A STUDY ON PHYSICO-CHEMICAL ANALYSIS OF WATER SAMPLES FROM DIFFERENT COLLEGE HOSTELS IN NAGERCOIL, KANYAKUMARI

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Abstract

A Freshwater is a limited and essential natural resource that supports human health, ecosystem stability, and socio-economic development. Rapid population growth, urbanization, industrialization, and intensive agricultural practices have significantly affected the availability and quality of freshwater resources, particularly groundwater. In India, groundwater is the primary source of drinking water for both urban and rural populations; therefore, assessment of its quality is crucial to ensure public health safety. The present study evaluates the physico-chemical characteristics of drinking water supplied to selected college hostels in Nagercoil, Kanyakumari District, Tamil Nadu. Drinking water samples were collected from five college hostels during September 2025 and analysed following standard procedures recommended by APHA (2017). Physical parameters such as appearance, colour, odour, turbidity, total dissolved solids (TDS), and electrical conductivity were examined. Chemical parameters including pH, total hardness, total alkalinity, chloride, sulphate, nitrate, fluoride, calcium, magnesium, iron, manganese, ammonia, phosphate, and Tidys value were also analysed to determine the overall quality of the water. The results revealed that all water samples were clear, colourless, and odourless, with turbidity values within permissible limits. The pH of the samples ranged from 6.75 to 7.45, indicating near-neutral conditions suitable for drinking purposes. Most of the chemical parameters were found to be within the acceptable limits prescribed by APHA standards. Sample C exhibited comparatively higher concentrations of TDS, hardness, alkalinity, calcium, magnesium, and chloride, whereas sample D showed the lowest values for most parameters. Iron was detected in all samples.

Keywords

Physico-chemical analysis; Drinking water quality; Groundwater; Water quality assessment;APHA standards

ENGINEERING-TECHNOLOGY-MANAGEMENT | **IC26/169**

ADVANCED MATERIALS FOR HIGH-EFFICIENCY ENERGY GENERATION AND STORAGE TECHNOLOGIES

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Abstract

The global transition toward clean and sustainable energy systems requires the development of innovative materials that enhance energy efficiency, reliability, and environmental compatibility. Recent advances in materials science have enabled the design of novel functional materials that play a critical role in energy conversion, storage, and distribution technologies. This research explores emerging material platforms, including advanced nanomaterials, functional polymers, hybrid composites, and low-dimensional materials, which address key challenges in renewable energy generation, electrochemical energy storage, and hydrogen production.

Materials engineering strategies aimed at improving energy density, charge transport, catalytic activity, thermal stability, and long-term durability—while simultaneously reducing cost and environmental impact—are emphasized. Key applications include high-efficiency photovoltaic devices, next-generation batteries and super capacitors, fuel cells, and sustainable hydrogen technologies. These transformative changes arise not from incremental improvements but from ground breaking research in materials that open new technological horizons.

Significant research opportunities exist in transitioning from carbon-based energy sources, such as gasoline and coal, to cleaner alternatives including electric transportation, solar, wind, and nuclear energy systems. Achieving this transition requires advanced materials for large-scale energy storage, high-efficiency and low-cost solar cells, corrosion-resistant alloys for high-temperature power conversion, light-weight composites for turbine blades, superconducting power cables, and advanced power electronics.

Modern transportation across air, land, and sea also relies on revolutionary materials innovations. Lightweight aerospace alloys, high-temperature engine materials, and advanced composites have significantly improved vehicle efficiency and safety. Future progress will depend on materials research for high-performance batteries, fuel cells, hydrogen storage, improved combustion systems, sustainable biofuels, and advanced tire materials. Overall, interdisciplinary materials research is essential for accelerating clean energy deployment and building a resilient, low-carbon energy future.

Keywords

Advanced materials; Energy efficiency; Economic benefits; Sustainability; Environmental impact

REAL-TIME EDGE-BASED DASHPOT DETECTION FOR ENVIRONMENTALLY SUSTAINABLE ADAPTIVE SUSPENSION CONTROL

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Abstract

Due to rapid urbanization and increasing vehicle density, the demand for intelligent automotive systems has increased, it not only enhances ride comfort but also supports environmental sustainability. Irregularities in the roads, such as potholes and speed breakers, result in high levels of vibrations, thereby increasing the fuel/energy consumptions, and the lifespan of the vehicles gets shorter because of the high levels of vibrations.

A real-time control system is designed for dynamic suspension control. The system involves a real-time dashpot and speed breaker detection using the YOLOv8 object detection model running on the Raspberry Pi device. Since the calculations are done locally in the edge device, there are no recurring communications to the cloud. An Arduiuno is used as AD converter for the Pi. The ADXL335 accelerometer is utilized for the measurement of the acceleration in the vertical direction to evaluate the performance of the suspension. With the information obtained from the road profile and the degree of vibration, the actuator adjusts the suspension accordingly to the PID control.

The adaptive suspension control system helps to eliminate inefficient energy dissipation that occurs when the vehicle oscillates excessively. The system optimizes the parameters of the suspension to reduce the impact of the mechanical stress involved in the suspension system, thus extending the lifespan of the suspension system. The smooth motion of the vehicles helps to improve energy efficiencies by eliminating the energy dissipation that occurs during vibrations. The system reduces material usage and amount of automobile waste generated, which makes it environmentally sustainable.

The proposed system is a major contributor to sustainable transportation since it will aid in energy conservation, the reduction of environmental influence, and the promotion of environmentally friendly automobile solutions. The system will further advance dynamics enhancement and energy-efficient and environmentally safe mobility solutions.

Keywords

Dynamic Suspension Control; Edge AI; YOLOv8; Raspberry Pi; Ride Comfortability; Enhancement

ENGINEERING-TECHNOLOGY-MANAGEMENT | **IC26/266**

COMPARATIVE ANALYSIS OF MACHINE LEARNING MODELS FOR DAILY STOCK CLOSING PRICE PREDICTION IN THE INDIAN

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Abstract

Financial markets are dynamic, nonlinear and uncertain making stock price forecasting a difficult problem. Proper forecasting of the stock closing prices would help investors to make effective trading decisions and financial risk management. This paper conducts a comparative analysis of machine learning approaches to daily stock closing price prediction of the target Steel and Mining industry companies listed in the NIFTY-50 index of the National Stock Exchange (NSE) in India. Several Regression Multiple Regression (MR), Random Forest Algorithm (RFA), and Long Short-Term Memory (LSTM) models are fitted with historical stock price data between January 2000 and November 2020. The framework proposed is purely based on the information at opening of the market, that is, the closing price of the previous day and the opening price of the current day and would thus be quite practical to apply in practice and eliminate look-ahead bias. The model performance is measured in terms of Mean Absolute Error (MAE), Mean Squared Error (MSE), Median Absolute Deviation (MAD) and the R^2 score. Experimental findings show that the Multiple Regression model performs steadily and better in most of the stocks being assessed, and the value of the R 2 is greater than 0.90 in a few companies. The results will imply that with a small amount of available features, less complicated statistical models could be more effective than more complicated deep learning architectures. The paper presents some useful knowledge on the use of models in actual stock price prediction.

Keywords

Stock price prediction; Machine learning; Closing price forecasting; Multiple regression; Random forest

ENGINEERING-TECHNOLOGY-MANAGEMENT | **IC26/267**

HYBRID CNN–REINFORCEMENT LEARNING CONTROL FRAMEWORKS FOR POWER ELECTRONIC CONVERTERS: A REVIEW

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Abstract

Modern power electronic converters play a critical role in renewable energy systems, electric vehicles, and smart grids, where operating conditions vary continuously due to load changes, disturbances, and fault events. Conventional control techniques, such as proportional-integral-derivative (PID) control and model predictive control (MPC), are widely used in industrial applications; however, their performance strongly depends on the accuracy of the system models and the fixed control parameter. Consequently, these approaches often face limitations under nonlinear dynamics and uncertain operating conditions. This paper presents a comprehensive review of hybrid Convolutional Neural Network-Reinforcement Learning (CNN-RL) control strategies for power electronic converters. In the CNN-RL framework, CNNs automatically extract meaningful features from voltage and current waveforms to represent system states, including normal and faulty conditions. These features are then utilized by a reinforcement learning controller to learn optimal control actions, such as duty-cycle regulation, through reward-based optimization. The CNN-RL approach enables adaptive, model-free control with improved efficiency, reduced harmonic distortion, and enhanced robustness, making it a promising solution for next-generation intelligent power electronic systems.

Keywords

Power electronic converters; Reinforcement learning; Hybrid CNN-RL control; Convolutional neural networks; Duty-cycle optimization

OPTIMIZATION OF CANTILEVER BEAM STRUCTURES USING MATLAB-GENETIC ALGORITHM TOOLBOX FOR ENERGY HARVESTING APPLICATIONS

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Abstract

Vibration-based energy harvesters utilize the ability of some active materials to generate an electric potential in response to external mechanical stresses. Cantilever beam structure is the most widely used mechanism for these applications. In this paper, Genetic Algorithm based optimization for solving both constrained and unconstrained optimization problems that is based on natural selection, is used to optimize the dimensions for effective energy harvesting. Fixing the boundaries of the length, breadth and height and keeping natural frequency, stress, and volume of the cantilever beam as the fitness functions, different optimisation values of the length, breadth and height of the cantilever beam are obtained. COMSOL Multiphysics 5.1 is used to simulate and verify the obtained optimised values for the different dimensions of the cantilever beam. The optimized values of length, breadth and height of the cantilever beam obtained using Genetic Algorithm in MATLAB R2014a showed a similar natural frequency, stress and volume as that of the simulated cantilever structure in COMSOL Multiphysics 5.1. A percentage error of 0.288% is found when the output obtained from MATLAB is compared with the output from COMSOL Multiphysics 5.1.

Keywords

Cantilever; Optimization; Energy harvesting; Genetic algorithm; COMSOL Multiphysics

ENGINEERING-TECHNOLOGY-MANAGEMENT | **IC26/270**

SCALABLE MACHINE LEARNING AND DEEP LEARNING FRAMEWORK FOR EARLY DETECTION OF POWDERY MILDEW IN GREENHOUSE-GROWN

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Abstract

Agricultural productivity is significantly affected by plant diseases leading to significant yield losses. Disease identification by traditional methods by manual inspection and laboratory analysis are time intensive. This study investigates the application of Machine Learning (ML) and Deep Learning (DL) for the automated detection of Powdery Mildew (PWM) in cucumber leaves. Images of healthy and PWM infected cucumber leaves were collected by the Authors research team under controlled greenhouse conditions which are grown in Karnataka, India. ML models were trained using features extracted through Histogram of Oriented Gradients (HOG) and HSV colour histograms. Further, parameters of DL models namely VGG16, ResNet50, MobileNetV2, DenseNet121, and EfficientNetB0 were fine-tuned using transfer learning on resized (224×224) images. The study shows that, Random Forest, Gradient Boosting Machine (GBM), and AdaBoost achieved the highest classification accuracy of 96.97%. However, prediction accuracy of VGG16 DL models was better followed by followed by ResNet50 and MobileNetV2 at 94% accuracy. This work contributes a robust, dual-approach framework for precision agriculture applications for robotic integration.

Keywords

Precision Agriculture; Image Classification; Plant Disease; Powdery Mildew; Cucumber Transfer Learning

DATA ANALYTICS FRAMEWORK FOR POST-COVID STRESS ASSESSMENT IN YOUNG ADULTS USING BIOFEEDBACK

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Abstract

The COVID-19 pandemic has created unprecedented mental health challenges among young adults, emphasizing the need for scalable and data-driven stress management solutions. This study proposes a Data Analytics framework for evaluating stress in young adults through biofeedback data collected using wearable devices. Physiological signals such as heart rate variability (HRV), respiration rate, and R-R intervals were aggregated, processed, and analysed using a hybrid approach combining statistical metrics and machine learning models. A four-week controlled breathing training intervention demonstrated significant improvements in stress indicators, with reduced heart rate and increased SDNN and RMSSD values. The integration of biofeedback and Data Analytics enables continuous monitoring, deeper insight into stress trends, and predictive modelling capabilities for long-term well-being.

Keywords

Data Analytics; Biofeedback; Stress Detection; HRV, Post-COVID; Wearable Devices

A HIGH-GAIN HYBRID BOOST – FLYBACK DC–DC CONVERTER FOR PV–BATTERY APPLICATIONS

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Abstract

Photovoltaic (PV) energy systems require efficient DC–DC converters to interface low-voltage sources with high-voltage DC buses. Traditional boost converters demand high duty cycles to achieve large voltage gains, leading to increased losses and high switch stress, while flyback converters face limitations related to leakage inductance and power handling. This work presents a hybrid boost–flyback DC–DC converter that combines the operational benefits of both topologies. The proposed converter achieves a high voltage conversion ratio with reduced semiconductor stress. A steady-state analysis is carried out to establish the voltage gain characteristics. Simulation and experimental results obtained from a laboratory prototype confirm the suitability of the proposed converter for PV–battery applications.

Keywords

Photovoltaic systems; DC–DC converters; High step-up conversion; Hybrid boost–flyback converter; Renewable energy

ENVIRONMENTAL-HEALTH-RESILIENCE | **IC26/161**

COMMUNITY LIVELIHOODS, ENVIRONMENTAL PRESSURES AND THE POTENTIAL OF ECOTOURISM FOR BIODIVERSITY CONSERVATION IN SANGILIPALAMA, NUWARA ELIYA, SRI LANKA

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Abstract

Urbanization and land use changes in Nuwara Eliya district, including areas like Sangilipalama have created rapid changes in community livelihoods, environment sustainability and biodiversity conservation. The aim of this research is to identify and explain those factors which shape the community livelihoods, perception of environmental pressure and support for ecotourism as a biodiversity conservation strategy in Sangilipalama, Nuwara Eliya district. The data was collected through structured questionnaire and field observations from June to September 2024, with a total of 100 responses. Explanatory Factor Analysis is used as the data analysis technique. The study assessed three major factors contributing to the change in conservation of biodiversity of Sangilipalama; impact of community livelihood, environmental pressure and potential of ecotourism. Community livelihood variables including, household income, living satisfaction, level of assets, frequency of firewood collection and education were significant in shaping conservation, while environmental pressure variables include severity of the environmental issues, problems in the forest area, water pollution, human wildlife conflict and household waste disposal. Ecotourism potential variables included, attitude towards ecotourism, willingness to participate in ecotourism, livelihood improvement, alternative occupational skills and improve facilities. Results indicated that the factor community livelihoods (Eigen value = 10.08; variance = 67.18%) was the most important in biodiversity conservation, followed by the environmental pressure (Eigen value = 3.16; Variance = 21.06%) and finally ecotourism potential (mean = 1.77; Variance = 11.77%). According to the findings, community livelihood was the most significant driver of the attitude towards biodiversity conservation in Sangilipalama. In addition, environmental pressures also influence local perception, while ecotourism is an untapped resource with great potential. Enhancing livelihoods through community-based ecotourism development can offer an effective pathway for sustainable biodiversity conservation in Nuwara Eliya District.

Keywords

Biodiversity potential; Community livelihoods; Ecotourism potential Environmental pressure; Local perception

ENVIRONMENTAL-HEALTH-RESILIENCE | **IC26/271**

LETHAL IMPACT OF POLYAMIDE AND POLYSTYRENE MICROPLASTICS ON ZEBRAFISH (*DANIO RERIO*) SURVIVAL: AN EXPLORATORY STUDY

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Abstract

The pervasive contamination of aquatic ecosystems by microplastics (MPs) poses a significant threat to organismal health, yet the mechanistic links leading to fitness-relevant outcomes remain poorly defined. This study investigated the toxicological effects of sub-chronic exposure to two common MPs, polyamide (PA) and polystyrene (PS) on the zebrafish (*Danio rerio*), with a focus on integrating morphological, behavioural, and lethal endpoints. Zebrafish were exposed to 1 mg/L of PA-MPs and PS-MPs for 21 days, and a suite of phenotypic responses was systematically monitored. Our results demonstrate that both MP types induced severe toxicity, but through distinct pathways. PS-MPs caused significant visceral damage, including stomach deterioration and necrotic pectoral fin lesions, and led to a statistically significant reduction in 21-day survival to 46.7%. In contrast, PA-MPs elicited specific teratogenic effects, most notably an upward bending of the caudal fin that correlated with severe locomotor impairments. A critical finding across both groups was a marked shrinkage of the esophagus, providing a mechanistic explanation for observed feeding inefficiencies and malnutrition. We conclude that MP exposure triggers a cascade of injuries from physical obstruction and direct abrasion to structural deformities that synergistically overwhelm physiological homeostasis, linking internal damage to ecological deficits and underscoring MPs' substantial hazard to aquatic life.

Keywords

Biodiversity potential; Community livelihoods; Ecotourism potential Environmental pressure; Local perception

APPLICATION OF UREA AND MURIATE OF POTASH AS BIOCHAR ABSORBED FORMS TO REDUCE NUTRIENT LOSSES

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Abstract

Though potassium (K) is a cation, it is liable to leaching loss in soils because it is a mono valent one. Considerable leaching of K from applied muriate of potash (MOP) has been reported in soils. Using biochar to absorb MOP may reduce this loss. While urea-intercalated biochar (UIBC) has been studied in Sri Lanka, research on MOP-absorbed biochar is limited. This study aimed to produce potassium-enriched biochar (PEBC) from coir dust and evaluated its potential as a slow-release fertilizer in combination with UIBC, formulated in a previous study. A preliminary research optimized PEBC production under two soaking methods (capillary and direct soaking) and three MOP concentrations (30%, 60%, and100%) in a two-factor factorial design with three replicates. Statistical analysis (two-wayANOVA, $P < 0.05$) confirmed that direct soaking, 100% concentration, recorded the highest potassium content 50.87%±0.01. A leaching column experiment was conducted using ten treatments: T1 – Control, T2 - Department recommendation, T3-100% UIBC, T4- 75% UIBC, T5- 100% PEBC, T6- 75% PEBC, T7-100% UIBC+100% PEBC,T8-100% UIBC+75% PEBC,T9-75% UIBC+75% PEBC and T10-75% UIBC+100% PEBC in a completely randomized design ($P<0.05$) with four replicates. Over four weeks, the leachate study expressed that all UIBC and PEBC combinations or single treatments significantly reduced the losses of cumulative nitrate and K compared to the department recommendation, indicating their potential as effective slow- release fertilizers.

Keywords

Urea-intercalated biochar; Potassium-enriched biochar; Soaking

ENVIRONMENTAL-HEALTH-RESILIENCE | **IC26/138**

PROMOTING GUT HEALTH AND ENVIRONMENTAL RESILIENCE THROUGH WILD FRUIT- BASED PROBIOTIC BEVERAGE INNOVATION

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Abstract

Growing consumer interest in dairy-free and sustainable nutrition has accelerated the development of plant-based probiotic foods. Underutilized wild fruits (UWFs) of Manipur, which grow naturally with minimal or no agricultural inputs, represent eco-resilient biological resources that support biodiversity conservation and low-impact food production systems. The present study aimed to develop a non-dairy probiotic beverage using UWF juice as a fermentation substrate and to evaluate its probiotic viability, functional performance, and environmental relevance.

An optimized UWF juice formulation was selected through sensory evaluation and subsequently inoculated with *Lactobacillus fermentum* BTFSN. The fermented product was assessed for probiotic viability, fermentation dynamics, and tolerance under simulated gastrointestinal conditions using in vivo experimental protocols. The selected strain demonstrated high survival rates under acidic and bile salt environments, indicating strong resistance to gastrointestinal stress. The UWF matrix effectively supported carbohydrate utilization and sustained probiotic viability during fermentation and storage, highlighting its suitability as a non-dairy carrier system.

In vivo evaluation further revealed improved gut microbial modulation, suggesting enhanced probiotic functionality and biological efficacy. The observed outcomes indicate that the developed formulation promotes favourable gut health responses while maintaining microbial stability. Additionally, the utilization of underutilized wild fruits contributes to value addition of indigenous bioresources, supports local biodiversity, and reduces dependence on dairy-based substrates that are associated with higher environmental footprints.

Overall, this study demonstrates the potential of UWF-based probiotic beverages as sustainable, functional alternatives to conventional dairy probiotics. The approach aligns with emerging trends in eco-friendly food innovation and highlights the role of indigenous fruit resources in advancing sustainable nutrition, environmental resilience, and functional food development.

Keywords

Plant-based probiotic; Wild fruits; Lactobacillus fermentum; Gut microbiota; Environmental sustainability

ENVIRONMENTAL-HEALTH-RESILIENCE | **IC26/147**

ENHANCING LANDSLIDE RESILIENCE IN SRI LANKA THROUGH ECOSYSTEM-BASED APPROACHES: INTEGRATING NATURE FOR DISASTER RISK REDUCTION

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Abstract

The Central highlands in Sri Lanka face increasing landslide risks from raised monsoons, deforestation, and urbanization. This claims dozens of lives annually and destroys infrastructure; for example, recent landslides caused by Cyclone 'Ditwah'. Ecosystem-based approaches (EbA) utilize vegetation, foresters, and bio-engineering to stabilize slopes, enhance soil cohesion, and regulate water flows. These are aligning with the National Adaptation Plan (NAP) 2016-2025, and World Bank-supported initiatives like the Climate Resilience Improvement Project (CRIP). This study focuses on EbA integration for landslide reduction in districts like Badulla, Matale, and Kandy, emphasizing nature-based solutions (NBS) such as reforestation, vetiver grass planting and also hybrid solutions for sustainable resilience. Important interventions include bio-engineering using deep-rooted species like bamboo and Gliricidia, landscape-level agroforestry to restore cover in degraded areas, and terracing with vegetation for slope stability to reduce soil erosion. Studies show that NBS outperforms traditional concrete retaining walls in durability and cost-effectiveness, with root reinforcement increasing shear strength and reducing soil moisture. These target high-risk areas and are based on National Building Research Organization (NBRO) guidelines and indigenous methods. Opportunities come from hybrid models that combine EbA with drainage engineering and community-led reforestation, but challenges include policy barriers, restricted scaling, and capacity gaps in supervision, especially for the forest-based solutions. A qualitative analysis of government reports, World Bank assessments, and NBS frameworks highlights the multi-benefit potential of EbA for climate adaptation and landslide disaster risk reduction (DRR). Methodologically, the study relies on qualitative analysis of policy documents, NBRO guidelines, and World Bank assessments, and findings highlight that ecosystem-based and hybrid solutions offer more sustainable, cost-effective, and resilient outcomes for landslide risk reduction than purely structural measures. Sri Lanka's eco-based landslide resilience will be improved regionally through strengthening NBRO training and regulatory reforms.

Keywords

Ecosystem-based approaches; Landslide resilience; Sri Lanka; Nature-based solutions; Slope stability

ENVIRONMENTAL-HEALTH-RESILIENCE | **IC26/148**

DIEL AND SEASONAL VARIATION IN THE TIME–ACTIVITY BUDGET OF THE JUNGLE BABBLER (*ARGYA STRIATA*)

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Abstract

Time allocation is a key ecological parameter that reflects the behavioural priorities and survival strategies of birds. Patterns of daily activity offer insight into how species cope with environmental variation, social dynamics, and group-living pressures. The Jungle babbler (*Argya striata*) is a well-known cooperatively breeding passerine widely distributed across the Indian subcontinent, making it an ideal model for examining social behaviour and group cohesion in different environmental conditions. In this study, we investigated the year-round division of time in Jungle babblers using scan sampling, integrating diel (morning vs afternoon) and seasonal (summer, monsoon, winter) variation. We quantified ten behaviours – six individual and four social – and developed a detailed ethogram to assess how temporal patterns shape cooperative breeding and group-level coordination. Among individual behaviours, the highest time investment was recorded in hopping (19%), followed by foraging (18%), resting (17%), calling (17%), flying (5%), and preening (4%). Social behaviours were dominated by sentinel activity (14%), with lower proportions of allopreening (3%), clumping (3%), and alertness (0.48%). The results showed no significant difference in any of the studied behaviour between morning and afternoon sessions. Significant differences in hopping, resting, clumping, and allopreening across sessions were detected by the Kruskal–Wallis test ($p<0.05$) and validated by Dunn's posthoc test. Annual time investment was divided into 69% individual behaviours and 41% social behaviours, highlighting the balance of individual and collective energy expenditure in this cooperative species. Seasonal shifts in clumping ($p<0.01$) and allopreening ($p<0.01$) indicated strong group bonding in response to environmental demands. For individual behaviours, significant variation in hopping ($p<0.02$), resting ($p<0.03$), and flying ($p<0.03$) between summer and winter provided insight into self-maintenance and physiological regulation in response to seasonal conditions. These findings demonstrate the behavioural flexibility and adaptive value of Jungle Babblers. In response to seasonal changes and ecological demands, they effectively partition their time as a group-living cooperative species.

Keywords

Time-activity budget; Seasonal variation; Behaviour; Cooperative breeding; Behavioural ecology

ECOSYSTEM RESTORATION AND COASTAL RESILIENCE AS THE TOOLS FOR SUSTAINABLE TOURISM VENTURE IN ARUGAM BAY

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Abstract

Coastal erosion along the coast of Sri Lanka has increases and caused significant degradation of coastal ecosystems, threatening biodiversity, local livelihoods, and the sustainability of tourism. As such, in alignment with the United Nations Sustainable Development Goals (SGD) such as SDG 11 (Sustainable Cities and Communities), SDG13 (Climate Action), and SDG14 (Life below Water) and the IPCC framework on climate-resilient development, this study examines ecosystem restoration as a strategic pathway to enhance coastal resilience and reduce disaster risk in Arugam Bay Eastern Province, Sri Lanka. Long-term shoreline change analysis combined with community-based observations revealed extensive degradation of natural coastal buffers along Arugam Bay. The loss of these ecosystems has intensified shoreline instability, increased exposure to wave action and extreme weather events. The semi-structured questionnaire survey amongst 90 respondents, representing residents, fishermen, and tourists, highlighted the extensive awareness of the severe impacts of coastal erosion on livelihoods and tourism. A SWOT analysis of existing coastal management practices identified natural and ecosystem-based adaptation and solutions as more sustainable and resilient alternatives, consistent with IPCC recommended adaptation strategies. Key restoration measures identified include sand dune rehabilitation, re-establishment of native coastal vegetation, protection of remaining natural buffers, and integration of nature-based solutions with suitable engineering structures. This study further revealed integrated management strategies, community engagement, and strengthened policy enforcement are required for long-term resilience. Overall, ecosystem restoration is essential for mitigating coastal erosion, enhancing disaster risk reduction, sustaining livelihoods, and supporting climate-resilient coastal development in Arugam Bay, Eastern Province, Sri Lanka. Further, similar approached can be utilized in other coastal landscapes too.

Keywords

Coastal management; Disaster risk reduction; Shoreline change; Nature based solution; Arugam bay

BIOMONITORING OF ATMOSPHERIC HEAVYMETALS USING NATIVE AND TRANSPLANTED LICHENS IN NILGIRIS AND COIMBATORE, TAMILNADU, INDIA

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Abstract

Background: Rapid urbanization and industrialization have significantly increased atmospheric heavy metal pollution, posing serious risks to ecosystems and human health. Conventional air-monitoring techniques are often expensive and spatially limited. Lichens, owing to their high metal-accumulating capacity and sensitivity to atmospheric contaminants, serve as effective biomonitors of air quality. Methodology: Native lichen samples were collected from selected sites in The Nilgiris, Tamil Nadu, including relatively pristine and semi-urban locations. Based on its high metal accumulation capacity, the foliose lichen Parmotrema stuppeum was selected for transplantation studies. Lichen thalli were transplanted to eleven locations in Coimbatore city, representing urban and rural environments. After exposure, samples were subjected to acid digestion, and concentrations of heavy metals (Fe, Zn, Cu, Cr, Ni, Pb, and Cd) were quantified using Atomic Absorption Spectroscopy (AAS). Results: Native lichens from The Nilgiris exhibited comparatively low concentrations of heavy metals, indicating low atmospheric pollution. However, among the Nilgiris sites, Botanical Garden and Coonoor recorded relatively higher metal concentrations, reflecting localized anthropogenic influences. Zinc ranged from 4–6 µg g^{-1}, copper 3–5 µg g^{-1}, nickel 2–3 µg g^{-1}, and iron 35–40 µg g^{-1}. Chromium was detected only in trace amounts, while cadmium was absent. In contrast, transplanted lichens from Coimbatore city showed significantly elevated metal accumulation. Iron recorded the highest concentrations (952–3865 µg g^{-1}), followed by zinc (41–155 µg g^{-1}), copper (3–25 µg g^{-1}), nickel (9–26 µg g^{-1}), and chromium (2–14 µg g^{-1}). The Ganapathy site exhibited maximum accumulation due to intensive industrial and traffic activities, whereas cadmium was detected only at Madukkarai, likely influenced by cement industries and limestone mining. Conclusion: The study confirms Parmotrema stuppeum as an efficient and cost-effective biomonitor for assessing urban air quality. Lichen transplantation proves to be a reliable tool for monitoring atmospheric heavy metal pollution.

Keywords

Lichen; Biomonitoring; Heavy metal pollution; Transplantation study; Urban Air Pollution

CLIMATE-INDUCED WATER QUALITY CHALLENGES: SEASONAL FLUCTUATIONS IN DRINKING WATER HARDNESS IN VAVUNIYA, SRI LANKA

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Abstract

Groundwater in hard-rock regions, particularly in the Vavuniya District, commonly exhibits high hardness due to dissolved calcium and magnesium ions released through water–rock interactions. Seasonal climate variability influences water hardness of both surface and groundwater by controlling recharge, evaporation, geochemical processes. Climate change intensifies these effects causing greater seasonal fluctuations and long-term increases in hardness. Unsustainable groundwater abstraction leads to increased concentrations of dissolved minerals, thereby reducing the suitability of groundwater for direct consumption by the Vavuniya community. Prolonged exposure to such mineral-rich drinking water has been linked to the prevalence of CKDu in affected communities. Groundwater from a dug well at the University of Vavuniya exhibited elevated total hardness during both dry (650 ± 20 mg/L as $CaCO_3$) and wet (605 ± 20 mg/L as $CaCO_3$) seasons, exceeding WHO's drinking water quality standards. Similarly, surface water samples collected from the Per Aru reservoir exhibited seasonal fluctuations in total hardness levels ranging from 120 to 400 mg/L, posing significant treatment challenges for the National Water Supply and Drainage Board (NWSDB). On the other hand, Reverse Osmosis (RO) techniques are widely used to meet drinking water demands despite its challenges, including complete removal of beneficial minerals and significant water wastages. To address these challenges, agricultural waste-derived biosorbents were assessed as alternative to reverse osmosis. Phosphoric acid–treated lemon and pomegranate peels achieved optimum hardness removal efficiencies of 67% (5 g/L, 300 min) and 73% (8 g/L, 240 min), respectively. Adsorption behaviour followed the Freundlich isotherm (R^2 = 0.78–0.82) and pseudo-second-order kinetics (R^2 = 0.88–0.92), indicating chemisorption, while column studies conformed to Yoon–Nelson and Thomas models. Overall, the findings demonstrate that low-cost biosorbents derived from agricultural waste offer a sustainable, economic and effective strategy for mitigating climate-driven groundwater hardness and associated public health risks, including CKDu, in hard-rock regions like Vavuniya.

Keywords

Adsorption; Biosorbents; Climate-induced; Groundwater; Hardness

ASSESEMENT OF ANTIFUNGAL ACTIVITY OF UNDERUTILIZED SEAWEEDS FROM THE MATHAGAL COAST, JAFFNA, SRI LANKA

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Abstract

Seaweeds are macroalga that inhabit in marine environment, which are known to possess bioactive compounds with antimicrobial, antioxidant, and anti-inflammatory activities. The study investigated the antifungal potential of selected underutilized seaweed species against *Aspergillus flavus*. Seaweed species, including the red algae *Acanthophora spicifera*, brown algae *Sargassum polycystum*, and green algae *Ulva lactuca*, were collected from the Mathagal coast along the northern shoreline of the Jaffna District, Sri Lanka and crude extracts were obtained through sequential extraction with organic solvents including hexane, ethyl acetate, acetone and ethanol. Phytochemicals of crude extracts were analysed using standard methods and antifungal activity was evaluated by "poisoned food technique". The Minimum Inhibitory Concentration (MIC) required for complete fungal growth inhibition was determined for the ethanolic extracts of the tested seaweed species. Phytochemical analysis confirmed the presence of flavonoids, alkaloids, terpenoids, saponins, phenols, and steroids in all three seaweed species. Although all the solvent extracts of the seaweeds exhibited antifungal activity against A. flavus, the ethanolic extracts of all seaweed species showed the highest antifungal activity, with more than 95% mycelial inhibition at a crude extract volume of 1 mL. The MIC values were 16–24 mg/mL for U. lactuca, 38.25–51 mg/mL for S. polycystum, and >86 mg/mL for A. spicifera. These findings highlight the potential of selected underutilized Sri Lankan seaweeds as promising natural sources of antifungal agent. Further studies are recommended to explore their application as eco-friendly bio-preservatives.

Keywords

Seaweeds; Aspergillus flavus; Crude extracts; Phytochemicals; Antifungal activities

EFFECTS OF HEAVY METAL EXPOSURE ON THE EARTHWORM EISENIA FETIDA (SAVIGNY, 1826) AND VERMICOMPOSTING EFFICIENCY

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Abstract

Heavy metal contamination in organic wastes presents critical environmental challenge, making sustainable methods essential. Vermicomposting utilizing the earthworm *Eisenia fetida*, is an environmentally sound strategy for transforming these wastes, however, the potential for bioaccumulation of toxic elements within the earthworms is a major concern that can comprise both the process efficiency and the safety of the final product. This study investigates the bioaccumulation of heavy metals in Eisenia fetida using Atomic Absorption Spectrometer (AAS) of earthworm samples. Twelve 10Kg capacity bins each containing 2 kg of cow dung slurry and 1 kg teak leaves (2:1) were used for the experiment. Four different treatments, (T1, T2, T3 and T4) such as Control, Captan, Mancozeb and Chlorothalonil respectively. Total of 100 earthworms were carefully weighted and released into each treatment. The treatments were arranged in Completely Randomized Design (CRD) and collected data were subjected ANOVA and DMRT mean separation using SAS 9.4 version. Weights of earthworm were recorded every 14 days for 45 days. Earthworm samples were collected from each treatment and subjected to AAS analysis to quantify the bioaccumulated heavy metals. The initial mean weight across the treatments was 2.17 ± 0.12 g. After 10 weeks, the control group (T1) showed a significant increase in biomass of 29 ± 0.08% [2.80 ± 0.08 g], whereas T2 (5 g MPs) exhibited a decrease in biomass of 12 ± 0.10% [1.97 ± 0.11 g] at P = 0.05. In contrast, T3 (10 g MPs) and T4 (50 g MPs) treatments showed highly significant weight loss, with average biomass reductions of 17 ± 0.09% [1.92 ± 0.10 g] and 24 ± 0.11% [1.72 ± 0.09 g], respectively, compared to the initial body weight at P = 0.05.The study also revealed that the earthworm guts, which were treated with Captan, had accumulation of 0.004 mg/L of Pb.

Keywords

Vermicomposting; Eisenia fetida; Heavy metal; Bioaccumulation

CONSUMPTION PATTERN, NUTRIENT AND ORGANOLEPTIC STUDY OF BLACK RICE IN IMPHAL AND COIMBATORE DISTRICTS, INDIA

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Abstract

Oryza Sativa L (Black Rice) is gaining popularity due to its functional properties. Hence, consumption patterns of black rice were studied in Imphal and Coimbatore districts of India and standardised recipes were developed based on the survey findings. A cross-sectional study was conducted among 400 families using random sampling. Validated questionnaire was used to study the consumption pattern of black rice. Following the survey, black rice was locally sourced and analysed for proximate composition, heavy metal trace elements content, and vitamins content using AOAC protocols and Inductively Coupled Plasma - Optical Emission Spectrometry (ICPOES) method. The most commonly consumed recipes, namely 'Kheer', 'Cheng kabok', 'Idly' and 'Dosa' were standardised and sensorily evaluated using 9-point hedonic scale. Statistical analysis namely Pearson chi square association and Duncan multiple range test was performed at significance level ($p < 0.05$) using SPSS 21 software. The comparative analysis of the consumption patterns of black rice among households of Imphal and Coimbatore Districts revealed that the frequency of consumption of black rice varied from monthly to occasionally. Out of the different processing methods, pressure cooking (52%) was most preferred method in Imphal and boiling (20%) in Coimbatore. Nutrient analysis shows black rice have good amount of protein, fibre and vitamins, and heavy metal trace elements were absent. Sensory evaluation on the overall acceptability of the recipes revealed that variations with 100%, 60%, 50% and 50% of black rice were higher compared to other variations (all $p < 0.05$). Pearson's Chi- square test showed significant association between ages with frequency of black rice consumption ($p < 0.05$) among families of Imphal district. Organoleptic evaluation revealed good overall acceptability for recipes. Black rice demonstrates strong nutritional profile and acceptable sensory properties. Long-term consumption of black rice helps the community to combat lifestyle disorders.

Keywords

Black Rice; Consumption Pattern; Nutrient Profile; Organoleptic Qualities; 9 Point Hedonic Scale

HEALTH-SCIENCE-NUTRITION | **IC26/133**

COMPARISON OF METABOLIC SYNDROME PREVALENCE USING FOUR DIAGNOSTIC CRITERIA IN JAFFNA POPULATION

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Abstract

Metabolic Syndrome (MetS) is a major risk factor that significantly increases the risk of cardiovascular diseases and type-2 diabetes. The diagnosis of MetS varies depending on the criteria applied.

This study aims to assess the prevalence of MetS in a representative sample of the Jaffna population using four established definitions: World Health Organization (WHO), International Diabetes Federation (IDF), National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III), and American Heart Association/National Heart, Lung, and Blood Institute (AHA/NHLBI).

A cross-sectional study was conducted involving 753 individuals drawn from two urban and two rural villages in the Jaffna district. Anthropometric, biochemical, and clinical parameters were collected to determine MetS status according to the four diagnostic definitions. Each participant was classified as having or not having MetS under each criterion set.

The prevalence of MetS varied substantially across definitions. According to the AHA/NHLBI criteria, 78.0% of the populations were diagnosed with MetS, the highest among all definitions. This was followed by 27.6% using IDF, 24.4% using NCEP ATP III, and 16.1% using WHO criteria. These differences highlight the influence of diagnostic thresholds and required components on prevalence estimation. A higher prevalence under AHA/NHLBI criteria suggests greater sensitivity or lower diagnostic thresholds in this population.

There is significant variation in MetS prevalence depending on the diagnostic criteria applied. The choice of definition has critical implications for public health surveillance and clinical decision-making. Findings underscore the need for contextualized guidelines in assessing metabolic risk in specific populations.

Keywords

Metabolic Syndrome; Prevalence; Diagnostic Criteria; Jaffna Population; Cardiovascular Risk

HEALTH-SCIENCE-NUTRITION | **IC26/137**

FRAMINGHAM CARDIOVASCULAR RISK ASSESSMENT AMONG THE UNIVERSITY OF JAFFNA STAFF: A CROSS-SECTIONAL STUDY

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Abstract

The Framingham Risk Score (FRS) is a prediction tool of cardiovascular disease (CVD) risk. This study assessed FRS among the university of Jaffna academic and non- academic staff and examined variations across age, gender and employment category.

A descriptive cross-sectional study was conducted among 90 university staff members. Fasting blood samples were collected, and lipid profiles were determined. FRS percentages were calculated based on standard criteria the Age, Total Cholesterol, HDL-Cholesterol, Systolic Blood Press (Treated vs Untreated) and Smoking status of the participants. Based on FRS, CVD risk level was categorized as low (<10%), intermediate (10-20%) and high (>20%).

Age of the participants was categorized into 3 groups (30-39, 40-49 and 50-59 years). The mean FRS of the total participants was 4.7 (±4.97) %. Of the total population, majority (57.8%), under 30-39 year group (55.6%), non-academics (64.4%), and at low risk (88.9%). Among the low risk group, 55.0% were males, 62.5% were under 30–39 years and 65.0% were non-academic staff. Whereas among those at intermediate-risk (10%) majority were males (77.8%), in 50–59 age group (88.9%) and non-academic staff (66.7%). Only one male academic staff under 50–59 age group was at high-risk. When FRS was analysed statistically significant differences were observed between both genders ($p<0.001$) and age groups ($p<0.001$).

Overall cardiovascular risk among university staff was low; however, increasing risk in males and advanced age suggests for targeted preventive strategies within specific demographic subgroups.

Keywords

Framingham Risk Score; Cardiovascular Risk; Staff of University of Jaffna

HEALTH-SCIENCE-NUTRITION | **IC26/155**

EVALUATING PROCESSING TECHNIQUES IN MILLETS FOR ADVANCES IN NUTRITION, FOOD SAFETY AND SUSTAINABILITY

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Abstract

Millets have been a staple crop for millions of farmers in Asia and Sub-Saharan Africa. Millets are resistant to many crop diseases and pests, can thrive on poor soils with little to no inputs, and can withstand harsh weather conditions. Millets are often called "Nutri-Cereals" due to their high nutritional content compared to the more commonly grown cereals; wheat, rice or corn. Postharvest operations, such as threshing, drying, cleaning, packaging, storage, processing and transportation are significant. Traditional processing methods for millets, such as hand pounding, sun drying, and stone grinding, have been used for centuries. Modern processing methods for millets, such as green milling technology, roller mills, hammer mills, and ball mills, have revolutionized the way these ancient grains are prepared for consumption. These technologies enable more efficient dehulling, grinding, and refining, which improve the texture and shelf life of millet-based products. The present investigation evaluates the nutritional composition, functional characteristics and shelf-life stability of major millet flours produced through traditional processing methods (TPM) and modern processing methods (MPM). Significant variations were observed in macronutrient retention, particularly in fat content, with pearl millet exhibiting higher fat levels in MPM flour (8.4%) compared with TPM flour (6.3%). Comprehensive assessments were conducted over multiple storage intervals (7 15 30 90 120 days) to determine the effects of processing on oxidative stability, moisture dynamics, microbial load, and changes in key nutritional parameters. Across millet varieties, MPM showed superior nutrient retention, reduced lipid oxidation, and lower moisture uptake, resulting in extended shelf life compared with TPM. Functional attributes, including water absorption capacity, were also improved. Additionally, MPM achieved greater reductions in anti-nutritional factors, enhancing the flour's suitability for diverse food applications. Overall modern processing technologies not only enhance nutritional quality and safety but also contribute to sustainability by reducing post-processing losses and extending product stability.

Keywords

Millets; Processing; Shelf life; Storage; Sustainability

HEALTH-SCIENCE-NUTRITION | **IC26/178**

A COMPARATIVE STUDY ON THE EFFECT OF DRYING TECHNIQUES AND ANTIOXIDANT ACTIVITY OF PHYTONUTRIENTS

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Abstract

Grape pomace, a major waste generated during wine manufacturing, poses environmental disposal challenges yet represents a valuable source of bioactive compounds and natural pigments. Sustainable processing strategies such as optimized drying can facilitate its utilization as a green extraction process. This study aimed to evaluate the effect of conventional (sun and shade) and non-conventional (freeze and cabinet) drying methods on the drying kinetics, colour stability, phytochemical profile, and antioxidant activity of grape pomace seeds and peels.

Samples were subjected to sun drying (33 °C, 2 days), shade drying (27 °C, 7 days), cabinet drying (80 °C, 3 days), and freeze drying (-45 °C, 7 days). Drying kinetics were assessed through moisture loss, drying time, weight reduction, and colour parameters (?L*, ?a*, ?b*, ?C*, ?E*). Qualitative phytochemical screening and IC50-based antioxidant assays were conducted using aqueous, ethanolic, and methanolic extracts.

High-temperature cabinet drying caused rapid moisture loss but resulted in severe colour degradation (?E* = 57.54) with intense darkening and chroma reduction due to thermal oxidation. Sun drying also induced noticeable browning. In contrast, shade and freeze-drying preserved colour integrity and exhibited lower weight loss. Non-conventional drying methods showed superior retention of phenolics, flavonoids, and antioxidant activity, with lower IC50 values, particularly in methanolic extracts.

This work integrates drying kinetics, colour degradation analysis, and antioxidant profiling to promote grape pomace as a sustainable, value-added green resource. Drying kinetics strongly influence the physicochemical quality of grape pomace. Low-temperature drying, especially freeze drying, effectively preserves pigments and bioactive compounds, supporting sustainable valorisation.

Keywords

Antioxidant activity; Colour degradation; Drying kinetics; Grape pomace; Green material extraction

BACTERICIDAL ACTIVITY AND SUSTAINABLE TOXICITY TESTING IN BRINE SHRIMPS OF NANOFABRICATED PLEUROTUS OSTREATUS

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Abstract

Pleurotus Ostreatus (oyster mushroom) are rich source of bioactive compounds which have significant properties of antibacterial, antifungal, anti-inflammatory, anti-tumor, antioxidant as well as possesses distinct flavour and taste. The used of nanoemulsion of entrapping bioactive compounds may enhance the anti-microbial properties. The objectives of the study to analyse bactericidal activity of formulated oyster mushroom extract nanoemulsion and to assess the toxicity of using Brine shrimps Lethality Assay. Mushroom extract (2% ME and 4% ME) encapsulated nanoemulsions were formulated as O/W (oil-in-water) emulsion by Sonication. Anti-bacterial assay was performed for the nanoemulsions using two Gram-positive (Staphylococcus aureus & Bacillus subtilis,) and two Gram-negative bacteria (Escherichia coli & Pseudomonas aeruginosa). Chloramphenicol was used as a positive control and aqueous as a negative control. Nanoemulsion was analysed Brine shrimp lethality assay to analyse toxic effect using Potassium dichromate ($K_2Cr_2O_7$). This experiment revealed that the zone of inhibition in diameter (mm) for 2% ME against S. aureus, B. subtilis, E. coli & P. aeruginosa were 13 mm, 17 mm, 21 mm & 14 mm respectively while 21 mm, 19 mm, 25 mm & 19 mm respectively for 4% ME. Oyster mushrooms extract encapsulated nanoemulsion was found to be less toxic than $K_2Cr_2O_7$ since the LC50 value was 7.26 mg/ml (which is >1mg/ml). Therefore, bioactive compounds from mushroom in nanoemulsion may be a new alternative food source since there is less toxic effect to Brine Shrimps.

Keywords

Anti-bacterial activity; Brine shrimps; Nanoemulsion; Oyster mushroom; Toxicity

HEALTH-SCIENCE-NUTRITION | **IC26/142**

PROBIOTIC APPROACH AS A NUTRITIONAL STRATEGY FOR BIOFORTIFICATION OF MILK WITH VITAMIN B12

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Abstract

Vitamin B12 is essential for neurological function and red blood cell formation, and its deficiency is a concern, especially in populations with low animal-product intake. This study developed probiotic milk using *Lactiplantibacillus plantarum* capable of synthesizing vitamin B12 during fermentation. Milk standardized to 4.5% fat and 8.5% SNF was inoculated with L. plantarum (1–6%) and incubated under controlled conditions. The strain showed good survival (>108 CFU/mL) and demonstrated strong gastrointestinal tolerance, exopolysaccharide (EPS) production, pathogen co-aggregation. Vitamin B12 concentration increased from 0.28 µg/100 mL in control milk to 0.42 µg/100 mL in probiotic-fermented milk, representing a 66% enhancement through microbial biosynthesis. Formulation of probiotic milk with 107 CFU/mL were of compatible sensory scores with control milk ($P<0.05$). Hence the study proved the nutritional property of synthesising vitamin B12 by probiotic strain and also probiotics in biofortification of milk with vitamin B12 in food system.

Keywords

Lactobacillus plantarum; B12; Probiotic milk; EPS; Co-aggregation

DETERMINANTS OF DIATARY PATTERN AND NUTRITIONAL STATUS IN RELATION TO FOOD SECURITY AMONG SELECTED ADOLESCENTS

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Abstract

Adolescents are nutritionally vulnerable due to rapid physiological growth and increased nutrient requirements. During adolescence, individuals have gone through series of key transitions into adulthood which may be hindered by food insecurity and poor nutritional status. The present study aimed to identify the factors that may be associated with food security and nutritional status of adolescents by integrating data from a Food Frequency Questionnaire (FFQ), socio-demographic characteristics, meal patterns, biochemical markers (haemoglobin and calcium), and environmental factors. This cross-sectional study was carried out among163 adolescents (male= 87, female= 76) aged 13 to 18 years in rural area of Bishnupur District, Manipur. Random sampling methods were used to enrolled adolescents in the study. Statistical analysis was performed. Result shows that, majority of the adolescents belong to nuclear family, 74% adolescents fall under upper-lower socio-economic background. In cereals, white rice consumed daily by respondents. Among pulses and legumes, masoor dhal was the most frequently consumed on weekly basis. Overall dairy consumption was low. Green leafy vegetables were frequently consumed daily (45.2%), while other vegetables showed a diverse consumption pattern. Seasonal fruits were primarily consumed weekly. Fats and oils demonstrated high daily consumption (86.0%), jaggery and sugar were also frequently consumed daily. Consumption of meat, eggs, pulses and legumes were not frequent, this shows the lack of protein, calcium, and other micro-macro nutrients which are necessary for the growth and development. Biochemical parameters indicate that, among the adolescent's haemoglobin levels were normal while calcium levels were low as a result from low dairy intake and others sources of calcium in their dietary pattern. Further interaction which includes educating the adolescents with proper materials which are appropriates for their age group are necessary to enhance their nutritional status at community level for their adult life.

Keywords

Adolescents; Nutritional status; Food security; Dietary pattern; Micronutrients

HEALTH-SCIENCE-NUTRITION | **IC26/182**

SOLUBLE FOOD FOLDS: AN ECO-SMART, MILLET-DRIVEN FOOD DESIGN FOR SUSTAINABLE FOOD AND NUTRITION SECURITY

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Abstract

Increased focus on sustainability in food innovation has led to the development of nutrient-dense food formulations using crops that are resilient to climate change. Soluble food folds have emerged as a sustainable alternative, delivering a low-waste, adaptable structure derived from starch-based formulations. In South India, many traditional foods are prepared from rice that has been soaked and ground finely to produce thin food folds; however, to date, the dilution of the batter has never been established as a standardised process. This study examined the optimisation and investigated the incorporation of finger millet (*Eleusine coracana*) to create soluble food folds that have enhanced function and may be employed for multiple purposes. Sensory analysis of rice batter diluted to three different dilutions (80 ml, 100 ml and 120 ml) indicated that 100 ml had the highest overall acceptability (7.93; $p < 0.001$). Textural analysis demonstrated that this dilution afforded an optimal balance between firmness (0.445 N) and flexibility (0.137 N). The optimised dilution of 100 ml was applied to different formulations of ragi rice blend (75:25, 50:50 and 25:75). Sensory analysis revealed statistically significant differences ($p=0.011624$) in consumer perception between the combinations against the standard, where the 50:50 formulation allowed for the most balanced set of sensory characteristics. The 50:50 blend with 100 ml dilution was analysed to find the effects of filtering the batter. The filtered batter produced food folds with greater levels of acceptability (8.167) than those made from unfiltered batter (5.233), with a significant difference ($p < 0.001$). The use of these folds as flexible carriers for dry and semi-dry formulations, such as health mixes, soup bases, curry powder, and porridge mixes, would create a convenient enriched-formula option that dissolves quickly when consumed. The results indicated that millet-based food folds are a viable option for sustainable, multi-purpose food design.

Keywords

Finger millet; Soluble food folds; Food and nutrition security; Sustainability

HEALTH-SCIENCE-NUTRITION | **IC26/216**

RELATIONAL BETWEEN SOCIO ECONOMIC STATUS AND ANEMIA AMONG THE TRIBAL ADOLESCENT GIRLS IN MEGHALAYA

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Abstract

Tribal adolescent girls are highly vulnerable to anemia. Anemia is a leading cause of morbidity and mortality in low and middle income countries and carried long term health and economic consequences. This study was conducted during the period 2023- 2024 in two districts, East Khasi hills and West Jaintia Hills, to assess the socio-economic status, to determine the prevalence of anemia and evaluate anthropometric indicators, including BMI, among tribal adolescent girls and to examine the association between socioeconomic status and anemia and between BMI and anemia among tribal adolescent girls. A community based cross sectional design was employed, involving 306 Khasi and Jaintia girls aged 13 -19 years selected using purposive sampling. Data were collected using a semi- structured interview schedule that included socio economic information, anthropometric measurements, haemoglobin estimation using cyanmethemoglobin method. Quantitative data were analyzed using SPSS version 25. Result: Most participants belonged to the lower middle socioeconomic group (41.6 % Khasi, 45.4 % Jaintia), which may influence dietary diversity and nutrition. Anthropometric findings reveled mean height, weight and BMI values below standard reference ranges in both tribes, with underweight status highly prevalent (57 % Khasi, 54 % Jaintia). Anemia was widespread among participants. Among Khasi girls, 42.2 were mildly anemic, 15.58 % were moderate anemic and 5.84 % severely anemic, whereas among Jaintia girls, 35.53 % were mildly anemic, 21.33 % moderately anemic and 10.5 % severely anemic. Association between socioeconomic status and anemia shows a significant correlated at ($p<0.001$). The findings highlight that socioeconomic constraints continue to limit effective food access and utilization among tribal adolescent girls, contributing to persistent anemia and undernutrition. This address the existing gap in community based evidence linking socioeconomic status with anemia in tribal populations of Meghalaya, underscores the need for specific nutrition interventions targeting socioeconomically vulnerable tribal adolescents in Meghalaya.

Keywords

Anemia; Anthropometry; BMI; Tribal; Meghalaya; Socioeconomic

NATURAL ANTIBIOFILM AGENTS FROM PERGULARIA DAEMIA: A SUSTAINABLE APPROACH TO ORAL AND ENVIRONMENTAL HEALTH

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Abstract

Pergularia daemia is a traditionally used medicinal plant with emerging relevance in environmental health and sustainable biomedical applications. The present study investigates its phytochemical composition, antimicrobial and antibiofilm activities, and its role in the green synthesis of silver nanoparticles (AgNPs). Phytochemical analysis of ethanolic leaf extracts revealed the presence of bioactive compounds, including alkaloids (5.3 mg/g), flavonoids (7.8 µg/g), and tannins (5.8 mg/g), contributing to its pharmacological potential. High-performance thin-layer chromatography (HPTLC) and high-performance liquid chromatography (HPLC) confirmed the presence of quercetin (26.34%) at Rf 0.90, with 100% identity at a retention time of 13.932 min, highlighting its therapeutic relevance.

Antimicrobial assays demonstrated significant activity of ethanolic extracts against oral pathogens, with a maximum zone of inhibition of 20 mm against Streptococcus mutans, while aqueous extracts showed zones up to 16 mm. The extracts also exhibited notable antibiofilm activity across tested microbial strains, indicating their potential in combating biofilm-associated infections. Acute toxicity studies revealed no adverse effects up to 2000 mg/kg, supporting a high margin of safety.

Furthermore, P. daemia was successfully employed in the eco-friendly synthesis of AgNPs. Characterization using UV-Vis spectroscopy (?max 480 nm), FTIR, XRD, SEM, and EDAX confirmed the formation of spherical, crystalline nanoparticles with a silver content of 80.24%. The synthesized AgNPs exhibited enhanced antimicrobial activity, with inhibition zones of up to 16 mm against S. mutans.

Overall, this study highlights Pergularia daemia as a sustainable bioresource with significant implications for environmental health, antimicrobial resistance management, and green nanotechnology. Its dual role as a medicinal plant and a green nanoparticle synthesizer supports its potential contribution to resilient, eco-friendly healthcare solutions. Further in vivo and clinical studies are warranted to validate its efficacy and environmental safety.

Keywords

Pergularia daemia; Phytochemicals; Quercetin; Antimicrobial activity; Antibiofilm activity; Oral pathogens

HEALTH-SCIENCE-NUTRITION | **IC26/238**

ROLE OF VITAMIN B IN MENTAL HEALTH

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Abstract

Mental health is linked to proper brain function, neurotransmitter synthesis, myelin formation, nerve protection, cognitive function and memory, which depend on adequate nutritional support. Among essential nutrients, the Vitamin B complex plays an important role in neural development and synthesis of neurotransmitters. Plays a role in DNA methylation and elimination of homocysteine. Deficiencies in key B vitamins B6, B9 and B12 have been increasingly associated with psychological disorders such as depression, anxiety and stress-related conditions. Understanding the role of Vitamin B in mental health is important for developing nutritional strategies to support psychological well-being and prevent mental health disorders.

Systematic reviews were identified through recognized scientific databases such as PubMed, Science Direct, and Google Scholar. Studies published in English that examined the relationship between Vitamins B1, B6, B9 (folate), and B12 with mental health outcomes including depression, anxiety, cognitive function, stress, and neurological health.

The importance in consumption of Vitamin B containing foods like meat, fish, eggs, dairy products, leafy greens, and whole grains helps in the overall brain function and development. The deficiency in these vitamins is strongly linked to depression, anxiety and many more neuropsychiatric disorders, as they play a major role in synthesis of neurotransmitters, cognitive function and myelin health.

The findings highlight the essential role of the Vitamin B complex in supporting mental health through involvement in neurotransmitter synthesis, brain energy metabolism, and maintenance of nervous system integrity. Adequate levels of Vitamins B6, B9, and B12 are associated with improved mood regulation, cognitive performance, and reduced risk of psychological disorders such as depression and anxiety. Deficiencies in these vitamins contribute to cognitive decline, emotional disturbances and neurological dysfunction. Sufficient Vitamin B intake through balanced nutrition or targeted supplementation may serve as a preventive approach to mental well-being and mental health disorders.

Keywords

Vitamin B; Deficiency: Brain; Neuro; Psychological

HEALTH-SCIENCE-NUTRITION | **IC26/237**

THERAPEUTIC EFFICACY OF NARINGENIN IN LEUKEMIA: CYTOTOXIC ASSESSMENT, PATIENT RESPONSE, AND MTR A2756G GENE POLYMORPHISM

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Abstract

Leukemia, a hematological malignancy, ranks 10th among other common cancers, affecting children and adults. Citrus fruits have anticancer potential due to their phytocompounds like flavonoids, polyphenols, limonoids, carotenoids, and essential oils. The current study explores the cytotoxic and apoptotic potential of the metabolic extract of *Citrus limetta* and *Citrus sinensis* pulp, and naringenin on PBL, Molt-3 cells, and CLL patient blood samples. The results of cytotoxic assays confirmed that the citrus pulp and naringenin induced cell death in a dose-dependent manner in the Molt-3 cell line, whereas they were not toxic to PBL. Further, flow cytometric analysis confirmed apoptosis induction and loss of mitochondrial membrane potential in Molt-3 cells treated with citrus pulp and naringenin. Since both citrus pulp and naringenin exhibited comparable cytotoxic effects, naringenin, being a single phytocompound, was selected for further evaluation on patient samples. The cytotoxic effect of naringenin was tested on 10 different CLL patients' blood samples in vitro. The results indicated that at lower concentrations, a few samples did not respond well, but upon increasing the concentration, all ten samples responded greatly to naringenin treatment. To further understand genetic factors contributing to leukemia, an extensive meta-analysis of leukemogenesis and therapy was conducted. Results revealed that India has an increased number of ALL patients due to MTR A2756G gene polymorphism, leading to hypermethylation. Therefore, regulation of the methylation can be supported through dietary supplementation with vitamins B6, B12, and folate to counteract impaired methionine synthase activity, thus preventing leukemia.

Keywords

Citrus fruits; Leukemia; Naringenin; ALL, CLL; MTR gene

IN VITRO ASSESSMENT FOR MULTIFACETED BIOACTIVE POTENTIAL OF *PRUNUS NAPAULENSIS* (SER.) STEUD FRUIT

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Abstract

The present study explores the bioactive potential of *Prunus napaulensis* (Ser.) Steud, an underexplored wild fruit endemic to the Himalayan region. Methanolic fruit extract was analysed using Gas Chromatography- Mass Spectrometry (GC-MS) for phytochemical profiling while a series of in vitro assays evaluated the anti-inflammatory, antidiabetic, antimicrobial and cytotoxicity of the fruit. GC-MS analysis identified bioactive compounds such as corilagin, 6-methoxyflavne and L-methionine which are known for their therapeutic properties. *Prunus napaulensis* fruit extract exhibited significant dose-dependent inhibition of a-amylase (IC50 =81µg/mL) and a-glucosidase (IC50= 73.9µg/mL) indicating as a potential antidiabetic compared to acarbose. Anti-inflammatory activity was analysed through protein denaturation and protease inhibition assay with IC50 values of 62.28µg/mL and 60.79 µg/mL respectively which were comparable to aspirin. Moreover, the fruit extract exhibited antimicrobial activity against *Staphylococcus aureus*, *Salmonella typhi* and *Escherichia coli* and validated its non-toxic by brine shrimp lethality assay (LC50=515,960.9 µg/mL). These results support the traditional use of *Prunus napaulensis* and highlight the potential as a safe source of natural bioactive compound for the development of nutraceuticals and therapeutic applications.

Keywords

Prunus napaulensis; Antidiabetic activity; Anti-inflammatory; Antimicrobial; GC-MS analysis; Brine shrimp assay

HEALTH-SCIENCE-NUTRITION | **IC26/241**

ATTENUATING THE VIRULENCE AND STRESS ADAPTIVE NATURE OF FOODBORNE LISTERIA MONOCYTOGENES USING INDIAN INDIGENOUS PROPOLIS

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Abstract

Listeria monocytogenes is a potential foodborne pathogen that causes listeriosis in humans and is responsible for substantial economic, societal and health burdens by developing resistance and biofilm formation. Considering its pathogenicity level, the World Health Organization has placed this pathogen at the top of the list of most deleterious foodborne pathogens. Listeriosis in India remains under-reported and underdiagnosed. Indeed, *L. monocytogenes* has been responsible for spontaneous abortions and stillbirths in women. Due to the emergence of antimicrobial resistance, an alternative and effective strategy is strongly required to address the global health crisis. Propolis, nature's hidden treasure, is obtained from honey bee hives that contain a lot of bioactive principles from various parts of the plants by bees. In the present investigation, native propolis was investigated to comprehend its antibiofilm and antivirulence activity against drug-resistant *L. monocytogenes*. In addition, the environmental stress adaptation behaviour of propolis treated L. monocytogenes was examined. Results: L. monocytogenes has the ability to produce cascades of virulence factors such as proteases, phospholipases (PC-PLC and PI-PLC), ActA protein and listeriolysin to exert their pathogenesis in the host. The results have revealed the biofilm inhibition and eradication potentials of extracted propolis against L. monocytogenes on various surfaces. The biofilm inhibitory action of propolis was further confirmed through confocal data of treated and untreated pathogens. Indeed, propolis has the superior activity in inhibiting the production of virulence factors in L. monocytogenes. Under various stress conditions, the tolerance ability of *L. monocytogenes* has been found to be drastically reduced in propolis treated ones compared with that of untreated ones. Propolis could be an alternative, wonderful approach for the complete inhibition and eradication of L. monocytogenes and prevention of their zoonotic transmission from the food industry and products to consumers, thus ensuring food and consumer health.

Keywords

Environmental Stressors; Food safety; Listeria monocytogenes; Propolis; Virulence Cascades

VALORIZATION OF FRUIT PROCESSING WASTE FOR FUNCTIONAL FOOD DEVELOPMENT AND ENVIRONMENTAL SUSTAINABILITY

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Abstract

Fruit processing generates substantial volumes of underutilized seed and peel waste, particularly from jamun (*Syzygium cumini*), amla (*Phyllanthus emblica*), mango (*Mangifera indica*), and jackfruit (*Artocarpus heterophyllus*). The present study investigates the valorization of these by-products into nutrient_dense, functional ingredients supporting circular food_system goals, reducing food_waste, addressing nutritional and sustainability challenges. Seeds (Jamun, Jackfruit), peels and kernels (Mango, Amla) were collected from processing units, dried, milled into flour or powders, and subjected to proximate, mineral, fiber, and phytochemical analyses. For Jamun seed, composition analyses indicate high carbohydrate and polyphenolic content, suggesting potential as bioactive ingredient. Amla exhibited high vitamin C and ellagitannins. Mango peel presented dietary fiber levels of 28–30% with significant mangiferin content, mango kernel flours contain 58-80 % starch, 6-13 % protein, 9-18 % fat and significant polyphenol and flavonoid contents with associated antioxidant activity. Jackfruit seed flour contains approximately 73.9 g/100 g carbohydrates, 31 g/100 g dietary fiber, 14 g/100 g protein, resistant starch, essential minerals, antioxidant capacity and prebiotic potential. Fruit waste residues are naturally rich in valuable bioactive compounds including dietary fiber, polyphenols, vitamins, minerals and natural antioxidants which makes them ideal for upcycling rather than disposal. Incorporation of these by-products into food matrices improved physicochemical attributes, enhanced shelf stability of bakery products, increased antioxidant capacity in beverages, improved water-holding capacity in extruded snacks, enhanced gluten-free formulations. Thus valorization of fruit processing waste has become increasingly important as the global food system seeks sustainable solutions. Hence fruit processing waste can be efficiently transformed into nutrient-rich, health promoting, environmentally sustainable and food system resilience.

Keywords

Food processing; By-product valorization; Functional food ingredients; Natural antioxidants; Food waste upcycling

HEALTH-SCIENCE-NUTRITION | **IC26/268**

FROM NATURE TO MEDICINE: HARNESSING NATURAL PRODUCTS IN DRUG DISCOVERY BY ENHANCING DATABASES

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Abstract

Natural products always played a significant role in the development of therapeutic agents. These products from plants, microorganisms, marine organisms, and other natural sources exhibit several pharmacological activities. Research focuses on improving and developing natural product databases used in drug discovery. This article is focused on the natural product resources that are available for the enhancement of drug discovery. The key objective of this review is to address the importance of open-access repositories, data annotation, machine learning and other technologies to share real-time data in analysing and enhancing the usage opportunities for scientists. The study emphasizes the importance of the Findable, Accessible, Interoperable, and Reusable (FAIR) data principles to ensure global accessibility and usability of natural products information. The natural products databases along with integration of modern technologies promote precise and user-friendly resources to the research community for scientific knowledge sharing and advancing drug development.

Keywords

Natural products; Databases; Phytocomponents; drug discovery

HEALTH-SCIENCE-NUTRITION | **IC26/272**

MACHINE LEARNING BASED 1D & 2D-SCREENING TECHNIQUES TO DETECT ANILINE CONTAINING NATURAL PRODUCTS

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Abstract

The dataset of natural products containing aniline was used to compare the performance of substructure matching versus fingerprint-based techniques for identifying substructures in the dataset of 500 natural products. The dataset collected was a balanced dataset; 50% of compounds containing aniline and 50% of compounds not containing aniline. Our comparison indicates that the substructure matching function significantly outperforms fingerprint methods in terms of computational time. This finding suggests that finger-print methods are advantageous for broader screening, while substructure matching offers superior performance for target detection. The dataset and insights from this study could enhance drug discovery processes by improving the accuracy of toxicity predictions.

Keywords

Aniline; Natural products; Toxicophore; Substructure matching; Fngerprints

HEALTH-SCIENCE-NUTRITION | **IC26/124**

EDUCATING FOR CREATION CARE AND HEALTH RESILIENCE: A CHRISTIAN EDUCATION PERSPECTIVE ON ECO-THEOLOGY AND PUBLIC HEALTH

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Abstract

Environmental degradation and public health vulnerabilities are increasingly interconnected, posing serious challenges to human well-being and community sustainability. While scientific and technological disciplines offer vital responses, there remains a need for value-oriented and formative approaches that address ethical responsibility, ecological consciousness, and community resilience. This paper explores the contribution of Christian Education within interdisciplinary discourse on eco-theology and public health.

The study employs a qualitative and interdisciplinary approach, drawing on biblical-theological reflection, Christian educational theory, and contextual analysis. The paper engages eco-theological insights on creation care and integrates perspectives from public health and resilience studies to examine the formative role of Christian Education in shaping responsible attitudes and practices.

The study identifies Christian Education as a formative praxis that nurtures ecological awareness, ethical responsibility, and health-conscious behaviour within faith communities. By integrating eco-theology with educational pedagogy, Christian Education enables communities to translate theological convictions into practical responses that support environmental sustainability and health resilience.

The paper concludes that Christian Education offers a meaningful interdisciplinary contribution by fostering values, community engagement, and ethical discernment essential for addressing environmental and health crises. Positioned alongside scientific and social scientific approaches, Christian Education enriches holistic efforts toward sustainable and resilient communities.

Keywords

Christian Education; Eco-Theology; Creation Care; Public Health; Environmental Ethics; Community Resilience; Sustainability

LANGUAGE-AND-LITERATURE | **IC26/131**

A MANDATE FOR A MULTI-PRONGED APPROACH IN ADDRESSING CLIMATE-CHANGE IN INSTITUTIONS OF HIGHER EDUCATION

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Abstract

The role of Higher Education Institutions in addressing climate impacts through education, research and social engagement for the future is unquestionably significant. Given this direction, the paper examines the need for appropriate pedagogical principles, syllabi, action-oriented learning, and philosophies that may be adopted in Higher Education Institutions, towards establishing a mandate for understanding and addressing climate impacts. The paper therefore, advocates curricula that integrate holistic understanding of climate events from multiple disciplinary perspectives while remaining anchored in learners' specific geographic and climatic contexts. It argues that localised, place-based learning framed within global climate realities can deepen relevance and strengthen both cognitive and affective engagement. Furthermore, the paper upholds the need to infuse spiritual stewardship that directs learners towards philosophical reflection, ecological consciousness, self-awareness and empathetic engagement with global communities in conjunction with intellectual rigour, thereby supporting personal commitment and the emerging of proactive, resilient communities.

Keywords

Higher Education Institutions; Climate Change Education; Place-Based Learning; Ecological Consciousness; Holistic Pedagogy

LANGUAGE-AND-LITERATURE | **IC26/049**

INTEGRATING AESTHETICS, REVERENCE, AND SPIRITUAL PERSPECTIVES IN ECOLOGICAL CONSERVATION

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Abstract

An old memory of grating camas root strikes Stacey and she remembers how she was asked to grate camas root for the feast after the winter dances. Stacey grates a little and then hesitates. When asked for a reason, she questions, “Doesn’t it hurt?” (Ravensong 173). Her mother tells her that it does hurt, but at the same time she tells Stacey, “Camas is here to take care of us. Never forget to be grateful. Don’t waste her, remember she sacrifices her life to you. Whisper sweet words to her. Give her courage” (Ravensong 173). This is a heart touching incident for any ecologically concerned individual, who places a huge amount of importance on little aspects of nature. A plant that comes from the natural world is entrusted with the character of a martyr who sacrifices herself for the betterment of others. In the indigenous communities, everything that comes from nature is revered and their utility capabilities are highly appreciated. This episode from Lee Maracle’s novel Ravensong reflects three integrated perspectives that take centre stage in ecological conservation. This research paper aims to highlight and prove that aesthetics, reverence and spiritual principles in its integrated form as a strong foundation that pushes individuals towards ecological conservation or at the least voice forth their concern and plans. They will also be seen as propelling factors that ensure a practical conservation action.

Keywords

Ecological conservation; Aesthetics; reverence; spiritual principles; integrated perspectives

LANGUAGE-AND-LITERATURE | **IC26/141**

THEORIZING ECO SPIRITUALITY - THE SOUL'S COMPASS IN THE WILDERNESS

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Abstract

When C. P. Snow addressed the need for the "two cultures", namely 'Science' and 'Literature' to cease being polarised and irreconcilable, he had set in motion the play or rather the interplay of ideas connecting Science and Literature. Eco Literature is certainly one realm which manifests this interplay. Long after C. P. Snow's arduous attempts to make the two groups of intellectuals (scientists and literatures) connect, it has become common knowledge, especially since the discourse on Eco Literature evolved that stories and storytelling play a significant role in shaping a culture that upholds stewardship of the environment and the world of Nature. This paper theorizes on the responses of undergraduate students to the story Amaroq the Wolf by Jean Craighead George, a story about Miyax, a little Eskimo girl who is lost in the arctic wilderness. Smitten by hunger her only hope lies in befriending Amaroq, the leader of a pack of wolves. She learns to "speak wolf". The process of unlearning human ways and exploring ways of making the "connect" with the wolves and eventually being accepted as one of "the pack", is an eye opener to the uncomplicated, yet unfathomable spirituality that can be acquired in a world far removed from human interference.

Keywords

Eco-criticism; Science–Literature Interface; Environmental Stewardship; Human–Nature Relationship; Narrative Ecology

LANGUAGE-AND-LITERATURE | **IC26046**

HEALING THE EARTH, HEALING OURSELVES: SUSTAINABLE HEALTH AND ENVIRONMENTAL RESILIENCE IN JEANNETTE ARMSTRONG'S *WHISPERING IN SHADOWS* AND AMITAV GHOSH'S *THE HUNGRY TIDE*

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Abstract

This paper examines how Jeannette Armstrong's *Whispering in Shadows* and Amitav Ghosh's *The Hungry Tide* explore the deep interconnection between ecological balance and human health. Through an eco-critical lens, the study argues that Armstrong's novel portrays illness as a direct consequence of environmental degradation and cultural dislocation, while Ghosh portrays resilience within a dynamic, unpredictable ecosystem under climate stress. Both narratives emphasize that sustainable health cannot exist in isolation from ecological and cultural sustainability. This comparative analysis demonstrates that environmental resilience, as envisioned in these works, demands both restorative practices rooted in ancestral wisdom and adaptive strategies shaped by scientific and local knowledge.

Keywords

Eco-literature; Science–Literature interface; Human–nature relationship; Environmental stewardship; Animal–human communication

PHYSICAL-CHEMICAL-MATHEMATICAL-SCIENCES | **IC26/144**

EFFECT OF Cu^{2+} IONS ON THE OPTICAL AND MAGNETIC PROPERTIES OF SEMIORGANIC NLO CRYSTAL: L-ALANINE CADMIUM CHLORIDE

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Abstract

This paper reports the effect of paramagnetic Cu^{2+} ions on the semiorganic Non Linear Optical (NLO) crystal L-Alanine cadmium chloride (LACC), grown from solution by slow evaporation at ambient temperature. Defect free and large size transparent crystals were harvested between 20-25 days. The powder X-Ray Diffraction (XRD) studies reveals the crystalline nature of the crystal. The powder XRD pattern of the as grown crystal is indexed using the 'TREOR' index software package. From the hkl values generated the lattice parameters of doped crystal was calculated using 'unit cell software' and was found to be, a = 16.38 Å, b = 7.30 Å, and c = 8.02 Å $\alpha = \gamma = 90.00^{\circ}$, $\beta = 116.56^{\circ}$. The functional groups were analysed by FT-IR spectroscopy. The FT-IR spectrum of doped crystal shows almost same nature as pure LACC except few small shifts in absorptions. These variations are due to the incorporation of dopant in the host crystal. The data generated by EDAX analysis consists of spectra showing peaks corresponding to the elements making up true composition of the specimen being analysed. Transparency range of the crystal was determined using UV-Vis- NIR spectrophotometer. The grown crystal has good optical transmittance in the entire visible region. The large transmission in the entire visible region and low cut off wavelength enables it to be a potential material for second and third harmonic generation. The magnetic properties were studied using VSM analysis. The plot of magnetic field versus magnetic moment traced at room temperature shows a diamagnetic effect. The values of the saturation magnetization (MS), coercivity (HC) and retentivity (MR) obtained were also reported and discussed.

Keywords

Amino acid; XRD; Transition metal; Diamagnetism

PHYSICAL-CHEMICAL-MATHEMATICAL-SCIENCES | **IC26/001**

ENHANCED PHOTOCATALYTIC EFFICIENCY OF PURE AND TRANSITION METAL ION-DOPED TITANIA NANOPARTICLES FOR ENVIRONMENTAL SUSTAINABILITY

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Abstract

The present study focuses on the development of efficient photocatalysts for environmental remediation through the synthesis of pure and transition metal ion (Zn^{2+}, Cu^{2+}, Zr^{4+}) doped titania nanoparticles using the sol–gel method. Thermal analysis enabled the prediction of suitable calcination temperatures that governed phase transitions and particle evolution. Pure titania exhibited spherical morphology, with particle size increasing upon calcination. The anatase to rutile transition occurred at 800 °C, accompanied by characteristic Ti–O–Ti vibrational bands confirming metal–oxide formation. The optical band gap decreased from 3.24 to 2.97 eV with rising calcination temperature, while photoluminescence studies indicated reduced charge carrier recombination, enhancing photocatalytic efficiency.

Doping significantly modified the physicochemical properties of titania. Zn incorporation improved crystallization, reduced the anatase to rutile transition temperature to 600 °C, introduced phonon confinement effects, and increased band gap due to size quantization. Enhanced charge separation and reduced activation energy resulted in superior photocatalytic performance, particularly for 4.0 wt % Zn-doped samples. Cu doping suppressed particle growth, uniformly reduced band gaps (2.98–2.76 eV), and improved electron–hole separation by introducing defect sites. Zr doping maintained the crystal structure but reduced particle size and lowered the transition temperature to 600 °C. Deep-level impurity states induced by Zr improved carrier separation and photocatalytic activity.

Photocatalytic degradation of methyl orange under visible light revealed consistently higher efficiency for anatase phase pure and doped titania. Among the dopants, Zn^{2+} introduced additional oxygen vacancies, yielding the most enhanced degradation performance. These findings highlight the potential of engineered titania nanostructures for sustainable pollutant removal.

Keywords

Keywords: Titania nanoparticles; Sol–gel synthesis; Metal ion doping; Photocatalysis; Environmental remediation

PHYSICAL-CHEMICAL-MATHEMATICAL-SCIENCES | **IC26/090**

STRUCTURAL AND OPTICAL STUDIES ON AMMONIUM PENTA BORATE CRYSTAL

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Abstract

Borate crystals have received much attention in nonlinear optical field. There has been an appreciable interest towards the synthesis and development of many borate crystals for the past few years due to their wide use in optical communication, laser medicine and signal processing. Especially alkali borate crystals having a wide range of optical transparency extended into the ultraviolet region due to the large difference in the electro negativities of B and O atoms. The borates crystals possess high damage threshold and high optical quality. Some of the borate crystals which have been reported earlier are (KB5), (K3CdB5O10) and (LAKB5). In present study, Ammonium Penta Borate crystal (APB) has been grown by employing the conventional slow evaporation method. The lattice parameters and crystal system have been found out and verified the close alignment with the reporter literature. FTIR analysis proved the presence of significant functional groups N-H and B-O. The optical bandgap is estimated as 5.13eV from Tauc's plot by extrapolating the curve to x-axis. The melting of the title compound started from 148.090C and the decomposition of the presence crystal in three stages has been discussed. The microhardening coefficient value suggests the soft nature of the compound. Etching pattern have been presented and its salient features were discussed. Photoluminescence studies have been carried out and its informations were explained.

Keywords

Slow evaporation method; Thermo gravimetric; Borate crystals; Microhardness; Optical band gap

PHYSICAL-CHEMICAL-MATHEMATICAL-SCIENCES | **IC26/088**

ENHANCED PHOTOCATALYTIC OXIDATION OF BI-CATIONIC DYE VIA SINGLE-STEP ANODIZED TITANIA NANOTUBES UNDER SUNLIGHT EXPOSURE

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Abstract

Dye pollution is a significant environmental issue affecting oceans, rivers, and agricultural lands. It disrupts ecosystems and poses risks to aquatic life and plant health, making it crucial to find effective solutions for sustainability. One promising approach involves using titanium dioxide (TiO_2) as a metal oxide material. This study focuses on TiO_2 nanotube arrays, which have a cylindrical shape with unique properties that allow them to absorb and degrade toxic dyes. These nanotubes are created using an anodization method with a two-electrode system and annealed them at 480 °C. X-ray diffraction (XRD) analysis confirmed the formation of the anatase phase, while Field Emission Scanning Electron Microscopy (FESEM) showed their nanotubular structure. Energy Dispersive Spectroscopy (EDS) verified the presence of Titanium and Oxygen, and Tauc plots indicated a wide bandgap of around 3 eV. Degradation of two cationic dyes: Crystal Violet (CV) and Malachite Green (MG) were tested using the synthesized TiO_2 nanotubes under sunlight. Both dyes absorb light within the 580 nm to 620 nm range due to their similar molecular structures. The degradation efficiency was 85.17% after 210 minutes, with a kinetic rate of 0.00769 min-1. These findings demonstrate a novel and environmentally friendly method for using TiO_2 nanotube arrays in dye wastewater treatment, contributing to efforts in reducing dye pollution and promoting ecological health.

Keywords

Titania Nanotubes; Photocatalysis; Bi-Cationic Dye; Anodization; Sunlight Irradiation

PHYSICAL-CHEMICAL-MATHEMATICAL-SCIENCES | **IC26/146**

BIOACTIVITY AND DOCKING STUDIES OF ß-CARYOPHYLLENE AND ITS A-CYCLODEXTRIN INCLUSION COMPLEX

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Abstract

ß-Caryophyllene (BCP) was isolated from the ethanol extract of Aeglemarmelos leaves using column chromatography and TLC. The purified compound was identified by GC-MS and further confirmed by HPLC and UV-Vis spectroscopy. An inclusion complex of the isolated ß-caryophyllene with a-cyclodextrin (a-CD) was successfully prepared using the co-precipitation method and structurally validated through 1H NMR analysis. Comparative evaluation of ß-caryophyllene and its a-cyclodextrin inclusion complex was performed for antimicrobial, antioxidant, anti-inflammatory, antidiabetic, and anticancer activities. The inclusion complex exhibited improved stability and enhanced biological performance compared to the free compound. The antibacterial and antifungal results showed that the BCP:a-CD complex displayed slightly higher inhibition zones than pure BCP against all tested bacteria and fungi. The IC50 value of BCP:a-CD (29.21 µg/mL) was significantly lower than that of BCP (58.39 µg/mL), confirming that a-CD complexation markedly enhances the antioxidant efficiency. a-CD encapsulation greatly improves the a-amylase inhibitory activity and overall antidiabetic potential of BCP. The IC50 value of the complex (48.07 µg/mL) is significantly lower than that of BCP (75.30 µg/mL), confirming that a-CD encapsulation enhances the anti-inflammatory potential of BCP. The IC50 value of the complex (28.03 µg/mL) is significantly lower than that of BCP (55.64 µg/mL), confirming that a-CD encapsulation greatly enhances the anticancer potency of BCP against MCF-7 breast cancer cells. Molecular docking using AutoDockVina supported the biological findings by demonstrating stronger binding interactions of the inclusion complex with key target proteins. Overall, the study highlights the potential of a-cyclodextrin encapsulation to enhance the therapeutic efficiency of ß-caryophyllene isolated from Aeglemarmelos leaves.

Keywords

ß-Caryophyllene; Aeglemarmelos; a-Cyclodextrin, Inclusion complex; Molecular docking

PHYSICAL-CHEMICAL-MATHEMATICAL-SCIENCES | **IC26/163**

SYNTHESIS AND CHARACTERIZATION OF UREA DOPED CALCIUM, MAGNESIUM, AND IRON PHOSPHATE NANOPARTICLES AND THEIR INTERACTION

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Abstract

Nanotechnology offers promising solutions, particularly through the development of nanofertilizers capable of controlled nutrient release and targeted delivery. The present study investigates the synthesis and comprehensive characterization of urea doped calcium, magnesium, and iron phosphate nanoparticles ($CMIPO_4$ NPs) and evaluates their physicochemical properties, water holding capacity, and agronomic performance in *Vigna mungo* cultivation. The interaction of these nanofertilizers with the biofertilizer *Azospirillum* was also examined to assess their synergistic effects on plant growth and stress physiology. Advanced analytical techniques, including Fourier transform infrared spectroscopy (FT IR), X ray diffraction (XRD), and scanning electron microscopy (SEM), were employed to confirm successful synthesis of urea-doped calcium, magnesium, and iron phosphate nanoparticles ($CMIPO_4$ NPs). The characteristic peaks of urea doped $CMIPO_4$NPs were recognized in the bands of FTIR. Irregular shaped agglomerated particles were clearly visible on the SEM image. The crystalline nature of nanoparticles formation was confirmed by XRD. The elements present in the urea doped $CMIPO_4$ NPs were confirmed by the EDX spectrum. A comparative assessment was carried out among different treatments: urea doped $CMIPO_4$ NPs combined with Azospirillum, urea doped $CMIPO_4$ NPs alone, conventional urea, and an untreated control. Agronomic and biochemical parameters, including proline content (0.3883 µg g^{-1}), soluble protein associated with photosynthetic efficiency (0.9343 mg g^{-1}), superoxide dismutase activity (0.7022 U g^{-1} FW), peroxidase activity (0.1370 U g^{-1} FW), and lipid peroxidation (-0.9048 U g^{-1} FW), were analysed to evaluate plant stress responses. The results demonstrated that urea doped $CMIPO_4$ NPs, particularly when integrated with Azospirillum, significantly enhanced nutrient availability, water holding capacity (up to 80%), and plant physiological performance compared to conventional treatments. Overall, the findings highlight the potential of engineered nanofertilizers in combination with beneficial microbial inoculants as an effective strategy for sustainable agriculture. This study provides a foundational framework for the advancement of nano enabled agro technologies aimed at improved nutrient management, enhanced crop productivity, and long term food security.

Keywords

Azospirillum; Proline; Photosynthetic efficiency; Superoxide dismutase; Peroxidase

PHYSICAL-CHEMICAL-MATHEMATICAL-SCIENCES | **IC26/175**

PHOTOCATALYTIC ENVIRONMENTAL REMEDIATION OF ZNO NANORODS ENGINEERED

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Abstract

Zinc oxide (ZnO) nanostructures have become promising photocatalysts in the context of environmental remediation due to its affordability, chemical stability, and facile synthesis. ZnO nanorods in this research were prepared through a sonication-mediated precipitation process by the use of the following precursors, namely; zinc nitrate hexahydrate and sodium hydroxide in the presence of deionized water as the reaction medium. The impact of reaction time on microstructural development, crystallinity and size-related characteristics of ZnO was studied systematically. The X-ray diffraction revealed that highly crystalline hexagonal ZnO was formed and that the crystallite size increased with increase in reaction time i.e., from 33 nm to 38 nm as the reaction time was extended from 1 h to 2 h respectively. The SEM showed a clear morphology of the nanorods, and a greater concentration of the nanorods was found in the later reaction times. Calcination drastically decreased agglomeration of particles and removed residue precursor species. The Fourier transform infrared spectroscopic analysis showed a strong absorption band at 468 cm-1 which was associated with typical Zn-O stretching vibration, which confirmed the formation of ZnO nanostructures. Photocatalytic activity of the ZnO nanorods thus prepared was tested by degradation of methylene blue dye under the irradiation of halogen light. The high degradation was observed to demonstrate the potential of these nanorods as efficient photocatalysts for removing organic pollutants. The results emphasize the importance of ZnO nanorods as eco-friendly functional materials in the applied physical and chemical sciences in sustaining environmental health and strength.

Keywords

ZnO nanorods; Photocatalysis; Environmental remediation; Methylene blue; Nanomaterials

GAS SENSING ABILITY OF TUNGSTEN DOPED V2O5 THIN FILMS DEPOSITED BY MAGNETRON SPUTTERING ASSISTED HFCVD

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Abstract

High-quality polycrystalline tungsten-doped vanadium pentoxide thin films were prepared using a magnetron sputtering–assisted hot filament chemical vapor deposition (HFCVD) method. The substrate-to-source distance and the reaction time were varied during the deposition process to study its effect on the properties of the deposited thin films. Scanning electron microscopy (SEM) and X-ray diffraction studies showed that the surface structure and crystal quality changed with different deposition conditions. Raman spectroscopy confirmed the formation of the synthesized material. By carefully adjusting the substrate-to-source distance and deposition time, an optimal nanostructured thin film with controlled morphology was obtained. The gas-sensing performance of the thin film with nanorods was tested for ammonia and ethanol. The film showed sensing responses of 1.8 for ammonia and 1.65 for ethanol at 200 ppm concentration, with response times of 39 seconds and 22 seconds, respectively. The recovery times were 44 seconds for ammonia and 31 seconds for ethanol, indicating good sensing stability.

Keywords

V2O5 nanorods; Thin films; Magnetron sputtering assisted Hot Filament CVD; Reaction time; Sensing response

PHYSICAL-CHEMICAL-MATHEMATICAL-SCIENCES | **IC26/245**

GROWTH, OPTICAL AND MAGNETIC STUDIES OF SEMIORGANIC NLO CRYSTAL: L-ALANINE CADMIUM CHLORIDE

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Abstract

L-alanine cadmium chloride (LACC), a semiorganic nonlinear optical (NLO) crystal has been grown from solution by slow evaporation at ambient temperature. The growth of the crystal has been carried out at pH 5.4. The crystalline nature of the grown crystal was observed using powder XRD analysis. The lattice parameters of the crystal obtained from SXRD analysis was verified with the theoretical values using unit cell software. EDAX analysis confirms the grown LACC crystal. The transmittance of the crystals was studied by UV-Visible spectrophotometer. The energy gap as calculated is 5.25 eV. The higher band gap energy shows that the defect concentration in the grown crystal is very low. From the results, it is clear that sample has good optical transparency in the complete visible region and it could be used for Opto-electronic applications. Using Nd-YAG laser the NLO property of the crystal is studied. The magnetic properties of the crystal were reported using Vibrating Sample Magnetometer (VSM) analysis. The M-H curve for pure LACC crystal shows a negative magnetic moment with increasing fields indicating a diamagnetic behaviour. Such materials tend to move from a stronger to a weaker part of a magnetic field. Further in diamagnetic compounds all the electron spins are paired. The transition element cadmium tend to give low spin complexes, that it is more favourable in terms of energy to pair electrons in the lower energy d levels rather than use the higher levels. Further, the orbital contribution is significant

Keywords

Semiorganic NLO crystal; EDAX; Band gap; Magnetic properties

PHYSICAL-CHEMICAL-MATHEMATICAL-SCIENCES | **IC26/281**

MULTIFUNCTIONAL CE/RGO NANOCOMPOSITES: HYDROTHERMAL SYNTHESIS TO ENHANCED MECHANICAL, ANTIBACTERIAL, AND CYTOCOMPATIBLE PERFORMANCE

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Abstract

The development of versatile, multifunctional biomaterials is a central challenge in advancing biomedical engineering. While reduced graphene oxide (rGO) offers a promising foundation, its integration into complex devices requires synergistic enhancement of its mechanical, surface, and biological properties. This study addresses this need by designing a novel cerium nanoparticle-decorated rGO (Ce/rGO) nanocomposite via a one-step hydrothermal method, targeting a unified platform with improved hardness, wettability, and inherent antibacterial activity without compromising cytocompatibility. The nanocomposite was characterized using XRD, Raman, and FT-IR spectroscopy, confirming successful synthesis and uniform integration, with morphology and composition analysed via FE-SEM and EDAX. Mechanical testing revealed a 35% increase in Vickers microhardness over pure rGO, indicating significant reinforcement. Surface analysis showed a transition to a more hydrophilic nature (contact angle reduction of ~40°) with controlled micro-porosity ideal for nutrient diffusion. Critically, biological evaluation demonstrated excellent hemocompatibility (<2% hemolysis) and enhanced Vero cell proliferation over 72 hours. Furthermore, a pronounced synergistic antibacterial effect was observed, with Ce/rGO achieving a >90% reduction in colony-forming units for both Staphylococcus aureus and Escherichia coli compared to pure rGO, attributable to the combined oxidative activity of cerium and the nano knife effect of rGO. These findings position hydrothermal-synthesized Ce/rGO as a highly promising candidate for demanding biomedical applications, including antimicrobial implant coatings, tissue engineering scaffolds, and drug delivery systems, where a combination of structural integrity and proactive biological interaction is essential.

Keywords

Cerium nanoparticle; Hydrothermal synthesis; Mechanical reinforcement; Hemocompatibility and cytocompatibility; Synergistic antibacterial activity

PHYSICAL-CHEMICAL-MATHEMATICAL-SCIENCES | **IC26/282**

AN ORGANIC BENZOTRIAZOLE-BASED SINGLE CRYSTAL FOR ADVANCED PHOTONIC APPLICATIONS: GROWTH AND MULTIFUNCTIONAL CHARACTERIZATION

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Abstract

The pursuit of advanced photonic technologies necessitates the development of organic materials that combine strong nonlinear optical (NLO) response with robust physicochemical stability and tailored functionalities. In this context, we report the successful synthesis and comprehensive characterization of a novel organic single crystal, EITB, engineered from a 1,2,3-benzotriazole derivative via a facile slow-evaporation technique. Leveraging the inherent p-conjugated framework and versatile hydrogen-bonding motifs of the benzotriazole core, this material exhibits an exemplary multifunctional profile ideal for integrated photonics. Single-crystal X-ray diffraction confirms its highly ordered monoclinic structure (space group P21/m), while powder XRD and FTIR spectroscopy validate phase purity and confirm key molecular vibrations. Critically, the crystal demonstrates outstanding optical properties, including wide transparency (~83% in the visible region), a UV cutoff at 270 nm, and a direct optical band gap of 4.59 eV, underscoring its utility for UV-photonics and laser applications. Z-scan analysis reveals superior third-order NLO performance, with significant third-order susceptibility (??³? ~ 3.10×10^{-8} esu), indicating strong potential for ultrafast optical switching and power limiting. Complementing these attributes, the material exhibits notable thermal resilience up to 185°C, a distinct negative photoconductive effect suitable for radiation-sensitive devices, favourable low dielectric loss, and commendable mechanical hardness. The synergistic integration of strong optical nonlinearity, excellent transparency, high thermal stability, and unique optoelectronic behaviour positions the EITB crystal as a highly promising and versatile candidate for next-generation nonlinear optical devices, integrated photonic circuits, and advanced sensor technologies.

Keywords

EITB organic single crystal; Nonlinear optical (NLO) properties; Slow-evaporation synthesis; UV-photonics and laser applications; Thermal stability and photoconductivity

PHYSICAL-CHEMICAL-MATHEMATICAL-SCIENCES | **IC26/250**

HYDROTHERMAL FABRICATION OF HIERARCHICALLY STRUCTURED BIOCL FOR ADVANCED PHOTOCATALYTIC APPLICATIONS

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Abstract

Bismuth oxychloride (BiOCl) nanoparticles were synthesised using a hydrothermal method and thoroughly studied to understand their photocatalytic behavior. X-ray diffraction (XRD) analysis confirmed the formation of highly crystalline, phase-pure tetragonal BiOCl. UV–visible diffuse reflectance spectroscopy (UV-vis DRS) showed strong absorption in the ultraviolet region, indicating a suitable band gap for photocatalytic applications. The chemical structure and purity of the samples were further verified using FTIR and FT-Raman spectroscopy, which revealed the characteristic vibrational modes of BiOCl. The photocatalytic activity of the synthesized BiOCl was tested by degrading methyl orange dye under Xenon lamp irradiation. The results showed excellent photocatalytic performance, with nearly complete degradation of methyl orange achieved within 60 minutes. This study demonstrates a simple and effective approach for developing efficient photocatalysts for dye degradation.

Keywords

BiOCl nanoparticles; Hydrothermal method; XRD; UV – DRS; Photocatalytic dye degradation

PHYSICAL-CHEMICAL-MATHEMATICAL-SCIENCES | **IC26/265**

SYNTHESIS OF BIOBR NANOPARTICLES WITH THE ENHANCED ANTIMICROBIAL ACTIVITY

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Abstract

This work reports a simple one-step hydrothermal method for the synthesis of bismuth oxybromide (BiOBr) nanoparticles and explores their antibacterial and antifungal performance. The structural, optical, and morphological properties of the synthesized nanoparticles were thoroughly characterized using X-ray diffraction (XRD), Fourier transform infrared (FTIR) spectroscopy, and scanning electron microscopy (SEM). XRD results confirmed the formation of phase-pure, highly crystalline BiOBr with an average crystallite size of 34 nm, calculated using the Debye–Scherrer equation. UV–Vis spectroscopy showed a band gap energy of 2.93 eV, indicating strong absorption in the visible light region. The surface morphology and elemental composition were further examined through SEM coupled with energy-dispersive X-ray (EDAX) analysis. The synthesized BiOBr nanoparticles exhibited effective antibacterial and antifungal activity, demonstrating their potential as antimicrobial agents. Overall, this approach offers a fast, low-cost, and environmentally friendly route for the synthesis of BiOBr nanoparticles with promising antimicrobial applications.

Keywords

Bismuth Oxybromide; XRD; Antibacterial; Antifungal

PHYSICAL-CHEMICAL-MATHEMATICAL-SCIENCES | **IC26/349**

APPLICATIONS OF MATHEMATICS IN ENVIRONMENT

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Abstract

Mathematics is not only the study of numbers, patterns, shapes, structures and logical relationships or contents that are limited within classrooms and textbooks. It helps us to understand, describe and solve problems in: daily life, science, technology, economics, and nature using Mathematical principles. It is described as; the only science that can prove statements with certainty, the only science capable of giving clear, absolute "Yes" or "No" answers without ambiguity, and etc. Without Mathematics, there would be no applied or theoretical science, atmospheric sciences, nor architecture, physics, chemistry, biology or anything else. That's because, it is the examination and application of numbers including quantities, volumes, structures and patterns. It uses concepts such as abstraction and logic, numbering and calculation, measurement of volume and distance, and the quantification of shape, motion and speed.

Keywords

Mathematical Foundations; Logical Reasoning; Quantitative Analysis; Scientific Modeling; Applied Mathematics

SOCIAL-SCIENCES | **IC26/145**

IMPACT OF HUMAN ACTIVITIES ON THE SARASALAI MANGROVE RESERVE, JAFFNA

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Abstract

Mangrove ecosystems are highly productive and valuable, offering important ecological, social, and economic benefits to coastal areas. The Sarasalai Mangrove Reserve, located in the Jaffna District of Northern Sri Lanka, is a significant wetland ecosystem that supports biodiversity and community livelihoods. However, this ecosystem is currently under severe pressure from various human activities. This study investigates the major anthropogenic factors contributing to mangrove degradation in the Sarasalai Reserve, proposes effective management and conservation strategies. The required primary data were collected through field observation, a questionnaire survey with fifty respondents, one structured interview, and discussions with officers of the Central Environmental Authority, and residents of surrounding areas. Secondary data from government reports and published studies were also reviewed to support and validate the findings. Quantitative data were analysed using descriptive statistics, while qualitative interview and field notes were examined through thematic analysis to identify recurring patterns of human-induced pressures. Findings reveal that land encroachment, solid waste dumping, firewood collection, B75 Chavakachcheri - Puloly road construction and bird hunting are the main causes of degradation. These activities have led to habitat fragmentation, pollution, declining fish stocks, and biodiversity loss. The study highlights waste dumping particularly plastic and electronic waste as the most critical issue .The study recommends urgent management interventions such as community-based monitoring, stricter land-use regulation, improved waste management, and official recognition of the site's ecological value to strengthen its conservation status. Strengthening institutional coordination and raising local awareness are essential to safeguarding the Sarasalai mangroves for future generations.

Keywords

Sarasalai Mangrove Reserve; Human activities; Mangrove degradation; Waste dumping; Conservation strategies

SOCIAL-SCIENCES | **IC26/136**

ASSESSMENT OF GROUND WATER QUALITY IN THE KODIKAMAM REGION, JAFFNA DISTRICT, SRI LANKA

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Abstract

Groundwater in Jaffna is precious yet a fragile resource. Its sustainability is threatened by overuse, salt intrusion, and pollution. Integrated approaches, combining modern governance frameworks with traditional water storage methods, are being explored to ensure the long term sustainability of groundwater resources for both communities and ecosystems. Therefore, establishing a groundwater monitoring network is essential for the sustainable management of water resources in the Jaffna Peninsula. This title suggests that the research will examine potential sources of contamination, analyse groundwater quality trends and explore possible solutions to improve or maintain water quality in the region

Keywords

Groundwater quality; Physicochemical parameters; Water sustainability; Sri Lanka

SOCIAL-SCIENCES | **IC26/154**

SCREW-PINE BIODIVERSITY CONSERVATION AND MANAGEMENT IN SRI LANKA

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Abstract

Plants of the Pandanus tectorius genus or screw-pines belong to the family Pandanaceae are found throughout Southeast Asia and Pacific islands. It has been observed in Sri Lanka's wild and coastal regions. The plant is also frequently planted as an ornamental in various places, particularly in Sri Lankan hotels and resorts. The animals and birds living along the coast find refuge in this pandanus environment. This versatile plant is used to make woven goods, medicine, staple foods, and building materials. Several aspects of this plant are beneficial to the local population. The objectives of this research are to protect biodiversity in its native environments, stop the degradation of coastal screw pine ecosystems, and strengthen the Sri Lankan economy by utilizing their products. This thorough analysis is based on online videos, webcasts, podcasts, and peer reviewed publications. There aren't any significant risks to the screw-pine ecology, and this species is common in Sri Lanka. Thus, the IUCN Red List of Threatened Species assigns the plant the classification of “Least Concern”. Both aromatherapy and traditional medicine use the plant's oil to treat pain and nerve weakness. Over time, there has been a significant increase in the demand for screw pine. Due to their valuable essential oil, screw-pines have proven to be especially susceptible to exploitation. In certain places, these plants are also chopped down to construct resorts. These plants will be regarded as threatened species in the future as a result. Due to their greater ability to thrive in a variety of soil types and temperatures, it is necessary to urge the public to cultivate these plants both naturally and artificially. This study provides information on how to conserve pandanus plants in their natural environment, reduce the frequency of natural disasters that these wetlands plants help to prevent, cultivate a lot more

Keywords

Pandanus tectorius; Pandanaceae; Screw-pine; Biodiversity; Conservation

#oypay; rPuoptpidj; jLf;Fk; fiuNahug; ghJfhg;gpy; fz;ly; jhtuq;fspd; gq;F - aho; Flh ehl;bid mbg;gilahff; nfhz;l Ma;T

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Abstract

,yq;ifapd; fiuNahug;gFjpfspy; fpl;lj;jl;l 6000 – 7000 n`f;lau; gug;G fz;ly; fhLfs; fhzg;gLfpd;wJ. jdpj;Jtkhd tuyhw;Wg; ghuk;gupaj;jpidf; nfhz;l aho; Flh ehl;L gFjpapDs; tlkuhl;rp> njd;kuhl;rp> typfhkk; kw;Wk; rg;j jPTfshd eapdhjPT> Gq;FLjPT> neLe;jPT> Ntyiz> mdiyjPT> vOitjPT> fhiujPT> kz;iljPT Nghd;w Gtpapay; gFjpfspid cs;slf;fpajhff; fhzg;gLfpd;wJ. aho; Flhehl;bdJ fiuNahug; gFjpfs; rkPg fhykhf fLikahd #oypay; rPuopT> fiu ,bT> cg;G ePu;g;guty;> capu;g;gy;tifik FiwT> kw;Wk; kdpj nraw;ghLfs; Nghd;w ,lu;ghLfspid vjpu;nfhs;fpd;wd. ,aw;ifahd fiuNahu ghJfhg;G mikg;ghf tpsq;Fk; fz;ly; jhtuq;fs; ,j;jifa rPuoptpid fl;Lg;gLj;Jtjpy; Kf;fpa gq;F tfpf;fpd;wd. fly; kw;Wk; Mw;wpdJ Kfj;Jthuq;fspy; cs;s cg;G ePupy; tsUk; jhtuq;fshf tpsq;Ffpd;w ,f; fz;ly; jhtuq;fs; flNyhug; gFjpfis miyfspypUe;Jk; flw;fiu mupg;GfspypUe;Jk; ghJfhf;fpd;witahf mikfpd;wd. gytpjkhd fly; tho; capupdq;fs; kw;Wk; gwit ,dq;fspw;Fk; thoplkhf ,f;fz;ly; jhtuq;fs; Kf;fpaj;Jtkilfpd;wJ. ,t; Ma;tpd; %yk; fz;ly; jhtuq;fs; kz; mupg;G jLg;G> capupay; gy;tifikg; ghJfhg;G> kPd;ts tsu;r;rp kw;Wk; fhyepiy khw;wj;jpd; jhf;fj;jpidf; Fiwj;jy; Nghd;w epiyfspy; tfpf;Fk; gq;fspg;Gf;fs; Fwpj;J Ma;T nra;ag;gLfpd;wJ. tpsq;ftpay; kw;wk; gFg;gha;T Kiwapaypidg; gpd;gw;wp nra;ag;gLfpd;w ,t; Ma;thdJ aho; Flhehl;bd; gFjpfspy; #oypay; rPuoptpidj; jLf;Fk; tifapy; fz;ly; jhtuq;fspd; gq;fpid Muha;tjid Kjd;ikahd Nehf;fkhfTk;> aho; Flhehl;bYs;s fz;ly; jhtuq;fspd; jw;Nghija epiyapid Muha;jypid Jiz Nehf;fkhfTk; nfhz;Ls;sJ. fz;ly; jhtuq;fspd; FiwthdJ fiuNahu r%fq;fspd; ghJfhg;gpidAk;> Rw;Wr;#oy; Rfhjhuj;jpidAk; ghjpj;J tUfpd;wJ. ,t; Ma;thdJ aho; Flhehl;bYs;s fz;ly; jhtuq;fspd; guty;> mit fiuNahug; ghJfhg;gpy; Mw;Wfpd;w #oypay; nraw;ghLfs; kw;Wk; kdpj nraw;ghLfspdhy; mtw;wpw;F Vw;gLk; mr;RWj;jy;fspid Mokhf Muha;fpd;wJ. fs Ma;T> Neu;fhzy; kw;Wk; juTg; gFg;gha;T Nghd;wtw;wpd; %yk; ngwg;gl;l jfty;fspd; mbg;gilapy; fiuNahu rPuoptpidf; Fiwf;Fk; tifapy; fz;ly; jhtuq;fspd; kWtsu;r;rp kw;Wk; ghJfhg;G Kaw;rpfs; vd;gtw;wpid vt;thW Nkk;gLj;jyhk; vd;gjidAk; ,t;tha;T Kd;itg;gNjhL vjpu;fhy fiuNahu Nkyhz;ikf;F gaDs;s gupe;JiufspidAk; toq;Ffpd;wJ.

Keywords

fz;ly; jhtuq;fs;;;;; aho; FlhehL; #oypay; ghjpg;G; jLg;G eltbf;iffs;; Rw;Wr;#oy; ghJfhg;G

SOCIAL-SCIENCES | **IC26/186**

MEDICINAL PLANTS USED IN THE SIDDHA SYSTEM OF MEDICINE IN KALAGAM, KAITHADY: DOCUMENTATION, BOTANICAL IDENTIFICATION

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Abstract

The Siddha system of medicine, widely practiced in South India and Sri Lanka, extensively uses medicinal plants for treating various ailments. Kalagam village in Kaithady harbors rich ethnomedicinal knowledge, yet systematic documentation of its medicinal flora is limited. This study aimed to document, classify, and analyze medicinal plants used in Siddha medicine, focusing on botanical families, plant habit, Siddha pharmacological attributes (Suvai, Veerya, Vipakam), therapeutic applications, and endemic status.

A descriptive cross-sectional ethnobotanical survey was conducted among elderly informants with traditional knowledge. Data were collected through field observations and transect walks, including local names, plant parts used, ailments treated, and preparation methods. Botanical identification was performed using herbarium comparisons, and expert consultation. Descriptive statistics summarized family-wise distribution, habit, lifespan, and Siddha pharmacological attributes.

A total of 105 species belonging to 52 families were documented. Fabaceae was the most represented family, followed by Asclepiadaceae, Euphorbiaceae, Malvaceae, and Amaranthaceae. Shrubs (37) and herbs (31) predominated. Bitter taste (Suvai) and hot potency (Veerya) were most common, while pungent post-digestive effect (Vipakam) predominated. Gastrointestinal, skin, and urinary disorders were the most treated ailments. Four endemic species Vernonia zeylanica, Plumbago zeylanica, Phoenix zeylanica, and Capparis zeylanica and high-value multipurpose species were identified. Leaves were the most frequently used plant part, reflecting sustainable practices.

This study highlights the rich ethnomedicinal diversity of Kalagam, Kaithady in Northern provine of Sri Lanka and provides a foundation for future pharmacological validation and conservation of high-value and endemic medicinal plants.

Keywords

Siddha medicine; medicinal plants; ethnobotany; Kalagam; Suvai; Veerya; Vipakam; endemic species

SOCIAL-SCIENCES | **IC26/217**

CYCLONE DITWAH AND HIDDEN BURDEN OF TOXIC FLOODWATERS: ENVIRONMENTAL JUSTICE AND HEALTH IN SRI LANKA

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Abstract

Cyclone Ditwah, which struck Sri Lanka in late November 2025, was one of the country's most devastating natural disasters in decades, bringing unprecedented rainfall, severe flooding, landslides, and mass displacement. While the immediate destruction of homes, infrastructure, and livelihoods captured global attention, a hidden crisis emerged beneath the floodwaters: the remobilization of legacy pollutants, toxic substances that have accumulated over decades from agricultural, industrial, and urban activities. These pollutants, stirred into rivers, soils, and residential areas, disproportionately threatened the health of marginalized communities, amplifying the suffering of those already vulnerable.

This study draws on qualitative analysis of environmental, health, and disaster response reports, including field data from affected communities. The UNEP Frontiers Report 2025 is used as a guiding framework, which highlights four key emerging environmental risks that intersect with human vulnerability. This paper focuses on one of these risks, "legacy pollution," illustrating how Cyclone Ditwah transformed an extreme weather event into a public health emergency and an environmental justice challenge.

Many affected communities lacked adequate housing, healthcare, and disaster preparedness, leaving them exposed to waterborne diseases, toxic exposure, and long-term health hazards. The unequal distribution of these risks underscores how disasters magnify pre-existing social and environmental inequities. Cyclone Ditwah revealed how environmental hazards and social vulnerabilities are deeply connected, disproportionately affecting the most marginalized communities.

To reduce these risks in the future, proactive and equity-centred approaches are essential. These include community-based risk mapping, identifying and cleaning up contaminated sites, evaluating sediments to understand hidden hazards, and rethinking flood protection using nature-based solutions. Investing in natural remediation of polluted sediments and integrating justice principles into public health and disaster response can help ensure that future extreme events do not put vulnerable communities at even greater risk.

Keywords

Legacy Pollution; Cyclone Ditwah; Environmental Justice; Public Health; Disaster Risk Governance

SOCIAL-SCIENCES | **IC26/230**

NATURE AS NATION: CULTURAL MEANINGS OF BIODIVERSITY ON SRI LANKAN CURRENCY NOTES

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Abstract

This paper examines the representation of biodiversity on Sri Lankan currency and its role in constructing national identity, cultural meaning, and awareness of natural heritage. Following Sri Lanka's transition to a republic with the 1972 Constitution, artist Laki Senanayake was commissioned in the late 1970s to design banknotes featuring exclusively endemic flora and fauna. Seven currency notes are unique, as no other Sri Lankan currency has been dedicated entirely to biodiversity, although many subsequent notes include individual endemic or endangered species as part of their design. The study addresses three key questions: How is biodiversity depicted on these currency notes? What were the discourses behind the inclusion of flora and fauna? And how does the selective representation of biodiversity communicate national identity to domestic audiences and tourists? The objectives are to analyse visual representations on these seven banknotes, explore their role in articulating a cohesive sense of Sri Lankanness, and examine their alignment with global conservation and heritage frameworks. A qualitative methodology is employed, combining iconographic and visual analysis with contextual interpretation, applying Benedict Anderson's theory of the imagined communities. Findings indicate that these currency notes construct Sri Lanka as biologically rich and culturally unified, marking a deliberate shift from political portraiture to neutral natural symbols. While biodiversity imagery communicates subtle environmental and heritage values and enhances the nation's appeal to tourists, its selective inclusion—limited to only seven notes—shows that nature was never the dominant theme in currency design compared to cultural heritage imagery. This selective representation underscores the need for further research into how environmental elements are prioritized or marginalized in everyday cultural objects and how they contribute to public understanding of biodiversity and national identity.

Keywords

Biodiversity; National Identity; Sri Lankan Currency; Cultural Representation; Heritage

SOCIAL-SCIENCES | **IC26/232**

BUILDING CLIMATE-RESILIENT HEALTH SYSTEMS THROUGH ENVIRONMENTAL JUSTICE AND ETHICS

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Abstract

Environmental justice highlights the moral necessity to address disproportionate environmental burdens on marginalized communities, where pollution, climate disasters, and resource scarcity raised health vulnerabilities. This paper addresses the intersection of environmental justice and ethics in promoting resilient health systems, drawing on case studies from urban slums in South Asia and indigenous lands in the Global South. We argue that policy interventions to reduce risks like water contamination and air quality deterioration, which sustain health inequities, must be guided by ethical frameworks based on the concept of distributive justice, intergenerational equity and participatory governance. Through mixed methods analysis of resilience indicators through secondary data and adaptive capacity indices and community health outcomes tested through regression models controlling for socioeconomic variables, we show how unethical practices like corporate green washing and inequitable disaster response undermine environmental health. Key findings show that, according to longitudinal data from Sri Lanka's flood-prone areas, justice-oriented strategies, such as community-led monitoring and rights-based litigation, increase resilience in vulnerable populations by 25-40%. As a conclusion, this work calls for an ethics-infused resilience paradigm that prioritizes "justice as recognition", urging policymakers to incorporate procedural fairness into the environmental health framework. By bridging theory and practice, it offers an actionable pathway for equitable, sustainable futures.

Keywords

Environmental justice; Ethics; Distributive justice; Participatory governance; Resilient health systems

SOCIAL-SCIENCES | **IC26/235**

ART AS ENVIRONMENTAL WITNESS: THARMAPALAN TILAXAN'S PHOTOGRAPHS OF ECOLOGICAL CRISIS IN SRI LANKA

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Abstract

This paper examines how Northern Province-based freelance artist Tharmapalan Tilaxan's photographic practice functions as a form of environmental witnessing, analysed through the theoretical framework of "art as witness" in visual culture. The study focuses on two of his key projects: Gurunagar (2019), which addresses environmental degradation of fishing shores and marine biodiversity in Jaffna, including garbage disposal along the seashore, and The Story of Pallakkaddu Elephants / Garbage-Eating Elephants (2020), which highlights threats to elephants in Oluvil consuming garbage as food. In both cases, Tilaxan documented the sites in situ, observing ongoing ecological challenges, before exhibiting the works locally and later in galleries, thereby mediating between the environment, local communities, and broader audiences. The research addresses three central questions: How does Tilaxan document environmental issues through photography? What ecological and social issues are represented, and how are they framed? And how do local communities, environmentalists, government authorities, and international audiences respond, and what changes or continuities result? The objectives are to analyse the artistic strategies employed to render environmental degradation visible, explore the cultural and social narratives embedded in the imagery, and assess the impact of these works on public awareness and environmental discourse while maintaining aesthetic form. A qualitative methodology is adopted, combining iconographic and visual analysis with interviews of the artist and examination of media coverage. Findings indicate that Tilaxan's photographs operate as both aesthetic objects and socio-environmental testimony, capturing ecosystem vulnerability and revealing tensions between human activity, conservation concerns, and ecological responsibility. Reactions vary, with local communities expressing ambivalence, environmentalists highlighting policy contradictions, and international audiences gaining heightened awareness. This selective and nuanced reception underscores the role of contemporary art in mediating environmental consciousness and highlights a gap in understanding how artistic documentation influences public perception, governmental authorities, and environmental discourse in Sri Lanka.

Keywords

Witness; Photography; Ecology; Crisis; Community Response

SOCIAL-SCIENCES | **IC26/240**

IMPACTS OF URBAN EXPANSION CAUSED BY TOURISM DEVELOPMENT IN NUWARA ELIYA MUNICIPAL COUNCIL AREA

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Abstract

Nuwara Eliya offers a variety of attractions and is a well-known tourist destination in Sri Lanka. The growth of tourism sites and unplanned urban expansion has had negative impacts on this region. This study focuses on urban expansion associated with tourism development in the Nuwara Eliya Municipal Council area during 2010–2020, and the associated environmental and socio-economic impacts. Primary data have been collected through fieldwork and interviews. Changes in urban growth trends were systematically analysed using a comparative method, with 2000 as the base year. The study employed GIS-based spatial analysis techniques, including Land Use Change Detection, Kernel Density Analysis, and Hotspot Analysis. The Landsat satellite images were used to analyse land-use change and spatio-temporal dynamics in urban growth between 2010 and 2020. The results reveal that, the urban growth around these areas has led to land-use changes, increased land values, environmental degradation, and infrastructure strain, creating socio-economic and ecological challenges. Buffer zone analysis (250 m–500 m) indicated that the urban expansion is most concentrated near high-demand tourism locations, heightening vulnerability to environmental hazards and unplanned development. This study suggests that there is a need for sustainable urban planning strategies and environmentally sensitive management policies to facilitate balanced development with minimal negative environmental and social impacts in the context of Nuwara Eliya as a tourism-intensive urban area.

Keywords

Tourism Development; Urban Expansion; Nuwara Eliya Minicipaal council; GIS Analysis; impacts

SOCIAL-SCIENCES | **IC26/045**

BREATHING INEQUALITY SPATIAL DISTRIBUTION OF AQI AND ENVIRONMENTAL JUSTICE IN URBAN INDIA

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Abstract

This Paper examines urban air pollution in India not simply as a environmental or public health problem, but as a specialized regime of inequality that actively produces social injustice. Drawing on high resolution Air quality index data from major Indian Cities, the study maps the uneven distribution of breathable air and demonstrates how exposure to atmospheric toxicity is structurally aligned with class, caste, occupation, housing forms conventional epidemiological and regulatory frameworks, the paper conceptualizes atmospheric stratification to show how air functions as an infrastructural resource unevenly allocated through zoning Practices, transport networks, industrial networks industrial siting, and informal urbanization. Methodologically, the analysis integrates geospatial mapping, temporal AQI Variation, Census-linked socio-economic indicators, and policy archaeology to trace how colonial planning legacies, neoliberal redevelopment, and smart-city imaginaries displace pollution toward marginalized population while shielding elite enclaves through green buffers, mobility privilege, and regulatory flexibility. The study introduces a novel metric cumulative breathing burden to capture long-term exposure rather than episodic pollution events. The findings reveal that urban environmental governance operates through selective visibility; pollution is monitored and mitigated where political power is concentrated, while remaining normalized elsewhere. Reframing clean air as a question of citizenship and rights, the paper argues for an environmental justice frame work grounded in equity cantered air governance and reparative urban planning

Keywords

Environmental; Inequality; Social Injustice; Urbanization; Pollution

SOCIAL-SCIENCES | **IC26/052**

AN ANALYSIS OF PENALTIES IMPOSED BY THE NATIONAL GREEN TRIBUNAL IN INDIA

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Abstract

The National Green Tribunal (NGT) plays a vital role in protecting the environment in India by ensuring compliance with environmental laws. This study analyses the penalties imposed by the NGT to understand the nature, purpose, and effectiveness in promoting environmental protection. The analysis focuses on the types of violations, the amounts of penalties imposed, and the sectors most frequently penalized. The study also examines how these penalties help to prevent environmental damage and encourage responsible behaviour among individuals, industries, and authorities. The findings highlight the importance of strict enforcement and monetary penalties in strengthening environmental governance in India and ensuring sustainable development. The study is based on secondary data collected from NGT judgments and official reports. Simple analytical tools are used to interpret the data and identify key trends. The results show that penalties vary depending on the severity and impact of environmental violations. The study also finds that higher penalties are often imposed in cases involving serious ecological damage. Overall, the study emphasizes the need for consistent and timely enforcement of penalties to improve environmental compliance.

Keywords

Green Tribunal; Environmental laws; Strict enforcement; Monetary penalties; Ecological damage

SOCIAL-SCIENCES | **IC26/096**

E-COMMERCE BOOM – ECONOMIC BENEFIT OR ENVIRONMENTAL BURDEN?

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Abstract

E-commerce has contributed substantially to economic development by creating employment opportunities, supporting small and medium enterprises, reducing operational and transaction costs, and enhancing market accessibility at both national and global levels. The digital marketplace enables businesses to operate with minimal physical infrastructure, promotes financial inclusion, and offers consumers greater convenience, product variety, and competitive pricing. E-commerce can reduce environment hazards by way of paperless transaction efficient inventory management and promotion of green product support for circular economy. The rapid expansion of e-commerce has raised critical environmental concerns. Increased dependence on packaging materials, particularly single-use plastics and cardboard, has intensified solid waste generation. Moreover, the growth of last-mile delivery services has resulted in higher fuel consumption, increased carbon emissions, and urban traffic congestion. The energy demands of warehouses, logistics networks, and data centres further contribute to environmental degradation. This paper argues that while the e-commerce boom serves as a powerful engine for economic growth, its environmental footprint presents a significant challenge to sustainability. The study emphasizes the need for sustainable logistics, eco-friendly packaging solutions, and the integration of renewable energy to balance economic progress with environmental responsibility.

Keywords

E-commerce Economic Development; Environmental Sustainability; Green Logistics; Carbon Emissions

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