

INTERNATIONAL CONFERENCE

ON

Bridging Disciplines for Resilience and Sustainability :
A Pathway to Viksit Bharat

(In Blended Mode)

15th and 16th December, 2025



Organized by

Department of Botany

Patna Women's College (Autonomous), Patna University, Patna, Bihar, India

4th Cycle NAAC Accredited at 'A++' Grade

In collaboration with

The Indian Science Congress Association, Patna Chapter

Compendium of Abstracts



International Conference

on

**“Bridging Disciplines for Resilience and Sustainability:
A Pathway to Viksit Bharat”**
(In Blended Mode)

In collaboration with
**The Indian Science Congress Association
Patna Chapter**

Organized By
Department of Botany
PATNA WOMEN'S COLLEGE
AUTONOMOUS
A Catholic Minority Institution
PATNA UNIVERSITY
4th Cycle NAAC Accredited 'A++' Grade
15th and 16th December, 2025

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आरिफ मोहम्मद खां
Arif Mohammed Khan

राज्यपाल, बिहार
Governor of Bihar



राज भवन, पटना-800022
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Message

I am pleased to extend my warm greetings and best wishes to the Patna Women's College (Autonomous), Patna University, Patna, Bihar, on the occasion of the International Conference on 'Bridging Disciplines for Resilience and Sustainability: A Pathway to Viksit Bharat'.

The theme of this conference is both timely and significant. In an era marked by environmental uncertainties, resource challenges and rapid scientific advancement, it is imperative that researchers and scholars work across disciplinary boundaries to create sustainable and resilient systems towards Viksit Bharat. By bringing together experts from diverse scientific domains, this conference offers a valuable global platform for meaningful dialogue, innovative thinking and collaborative solutions.

I commend the organizing Department and its collaborators for their dedication to promoting scientific inquiry and knowledge exchange. Such initiatives play a vital role in advancing research excellence and fostering a culture of interdisciplinary cooperation in higher education.

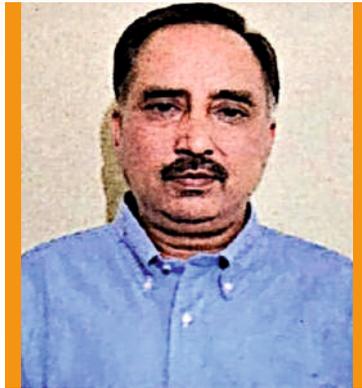
I am confident that the deliberations of this conference and the contributions compiled in this souvenir will inspire further research and serve as a valuable reference for future academic endeavours.

I extend my heartfelt wishes for the grand success of the conference and for the continued progress of the Department of Botany, Patna Women's College and the Indian Science Congress Association, Patna Chapter.

Arif Mohammed Khan

Prof. (Dr.) N.K. Agrawal
Director, Higher Education
Education Department
Govt. of Bihar, Patna

New Secretariat
Vikas Bhawan, Bailey Road
Patna-800015



Message

I extend my heartfelt congratulations to Patna Women's College, Patna University, on organizing the two-day International Conference on "Bridging Disciplines for Resilience and Sustainability: A Pathway to Viksit Bharat," scheduled on December 15th & 16th, 2025. As an autonomous institution accredited in the 4th Cycle of NAAC with an A++ grade, the College continues to exemplify academic excellence and leadership in women's education. I am confident that this dialogue will inspire new collaborations, sharpen methodological approaches and generate insights of enduring value for both research and policy. I wish the administration, faculties and students a great success for the conference and trust that it will foster meaningful dialogue, collaboration and interdisciplinary insights contributing to a resilient and sustainable future.

A handwritten signature in blue ink, consisting of a circular mark followed by the name 'N.K. Agrawal' and the date '20.11.2025' written below it.

Prof. (Dr.) N.K. Agrawal



PATNA UNIVERSITY PATNA



Message

I am pleased to extend my warm greetings and best wishes to the organizers, participants, and distinguished guests of the International Conference on “Bridging Disciplines for Resilience and Sustainability: A Pathway to Viksit Bharat,” being hosted by the Department of Botany, Patna Women’s College (Autonomous), Patna University, in collaboration with the Indian Science Congress Association.

As India envisions the progression towards Viksit Bharat, the role of interdisciplinary research and academic collaboration becomes increasingly essential. I am confident that this conference will provide a dynamic platform for scholars, researchers, academicians, policymakers, and students to exchange knowledge, foster meaningful dialogue, and explore innovative strategies for resilience and sustainability. Such academic endeavors strengthen the scientific spirit while nurturing a sense of responsibility towards our planet and future generations.

I congratulate the organizing committee for conceptualizing and executing this significant academic initiative. I also extend my best wishes for the fruitful deliberations and successful conduct of the conference. May this event lead to valuable outcomes and inspire continued commitment to sustainable and inclusive development.

Namita K

Prof. (Dr.) Namita Kumari
Dean, Faculty of Science
Patna University, Patna

INDIAN SCIENCE CONGRESS ASSOCIATION



Message

I am delighted to extend my warm congratulations and best wishes for a two day International Conference on the theme "Bridging the Disciplines for Resilience and Sustainability: A Pathway to Viksit Bharat", organized by the Department of Botany, Patna Women's College (Autonomous), Patna University in collaboration with the Indian Science Congress Association (ISCA), Patna Chapter.

The conference theme emphasizes the need for interdisciplinary collaboration to address the multifaceted challenges of environmental sustainability, climate resilience, and national development. In the spirit of Viksit Bharat, such academic endeavours provide a platform for scholars, researchers, and practitioners from diverse fields to converge and exchange transformative ideas that can guide India towards a sustainable and inclusive future.

I wish a grand success of this two-day International Conference.

Dr. Vijaya Laxmi Saxena
Former General President



Molecular Business Unit
Rue Louis Plescia 8, 4102 Seraing, Belgium



Message

It gives me immense pleasure to be part of the *International Conference on "Bridging Disciplines for Resilience and Sustainability: A Pathway to Viksit Bharat"*, organized by the Department of Botany, Patna Women's College, in collaboration with the Indian Science Congress Association, Patna Chapter.

The theme of this conference resonates deeply with the evolving global and national priorities that emphasize the integration of diverse disciplines- science, technology, social sciences, and innovation-to build a resilient and sustainable future. The idea of *Viksit Bharat* reflects India's vision of inclusive growth, driven by scientific inquiry, collaboration, and societal well-being.

As we stand at the crossroads of rapid scientific advancement and urgent sustainability challenges, this conference provides an excellent platform for researchers, academicians, and innovators to engage in meaningful dialogue, share transformative ideas, and co-create actionable pathways for progress. It is through such interdisciplinary collaboration that we can translate knowledge into impactful solutions for a sustainable tomorrow.

I extend my heartfelt appreciation to Patna Women's College for its commitment to academic excellence and its leadership in fostering such forward-looking discussions. I am honored to contribute to this endeavor and look forward to the stimulating exchange of ideas that this conference promises.

A handwritten signature in blue ink that reads "Vivek Priy".

Dr. Vivek Priy Dave

Scientist & Business Unit Leader
Molecular Unisensor SA, Belgium

U.S. Department of Veterans Affairs

Los Angeles, California 90073, USA.



Message

Organizing the International conference on “Bridging Disciplines for Resilience and Sustainability: A Pathway to Viksit Bharat” is a unique academic event of Department of Botany, Patna Women’s College, Patna University. This conference is to provide an insightful platform that will guide future trajectory of high-quality research at this oldest institution of women education in Bihar. My best wishes are for the grand success of this conference.



Sunil Kumar

PhD., Principal Investigator
Department of Research
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SAM HOUSTON STATE UNIVERSITY

Member The Texas State University System

Biological Sciences



Message

Thank you for your invitation for the **"International Conference on "Bridging Disciplines for Resilience and Sustainability: A pathway to Viksit Bharat"**, organized by the Department of Botany, scheduled on December 15-16, 2025. The topic of the conference is focused on global importance. There has been great progress in interdisciplinary-collaborative research, and they are being integrated at various levels of scientific disciplines.

I wish you and the organizing committee great success with the conference which brings together scientists, educators and students from different subdisciplines of biological sciences, and would provide intellectual and creative conversations and network opportunities for the participants.

Sincerely,

Madhusudan Choudhary

Madhusudan Choudhary

Ph. D., Professor of Genetics
Genomics and Molecular Biology
Department of Biological Sciences
Sam Houston State University
Huntsville, Texas, USA

ISCA, Patna Chapter



Message

I am honoured and privileged to welcome you to the International Conference on “Bridging Disciplines for Resilience and Sustainability: A Pathway to Viksit Bharat.”

This conference offers a fresh perspective on advancing scientific research and enhancing the analytical quality of research outcomes. It highlights the growing need for interdisciplinary approaches to address the multifaceted challenges of environmental sustainability, climate change, and national development on the path toward a Viksit Bharat.

I hope this conference inspires the younger generation to actively engage in both teaching and research.

I extend my best wishes for the grand success of the conference and for the publication of the Souvenir.

Sheo Satya Prakash

Sheo Satya Prakash

Convener

ISCA, Patna Chapter



PATNA WOMEN'S COLLEGE

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Message

It is a matter of great satisfaction and institutional pride to present this International Conference on "Bridging Disciplines for Resilience and Sustainability: A Pathway to Viksit Bharat." The theme of this conference underscores the growing need for collaborative and interdisciplinary approaches to address the complex challenges that confront society today.

As institutions of higher learning, we bear a significant responsibility in fostering research, innovation, and knowledge dissemination that contribute to national and global development. This conference provides an important academic platform for researchers, scholars, and professionals from diverse fields to engage in meaningful deliberations, share emerging insights, and explore strategic pathways for resilience and sustainability. Such efforts are vital for advancing the vision of Viksit Bharat, grounded in scientific temper, environmental stewardship, and inclusive progress.

Patna Women's College, with its legacy of excellence and commitment to quality education, remains steadfast in creating opportunities that strengthen academic dialogue and promote interdisciplinary collaborations.

I am confident that the ideas and discussions emerging from this conference will inspire innovative research, and support institutional efforts toward sustainable development. I extend my appreciation to the organizing committee for their dedicated efforts and meticulous planning.

With God's blessings I extend my best wishes for the grand success of the conference and for enriching and fruitful engagements for all attendees.

M. Rashmi A.C.

Dr. Sister M. Rashmi A.C.

Principal

Patna Women's College



PATNA WOMEN'S COLLEGE

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Message

It gives me great pleasure to announce that the Department of Botany, Patna Women's College (Autonomous), Patna University, in collaboration with the Indian Science Congress Association, Patna Chapter, is organizing a two-day International Conference on "*Bridging the Disciplines for Resilience and Sustainability: A Pathway to Viksit Bharat.*"

The chosen theme is both relevant and significant in today's context. Achieving resilience and sustainability across social, economic, and environmental dimensions remains one of the greatest global challenges. Addressing these complex issues requires moving beyond traditional academic boundaries and promoting collaboration among the natural sciences, social sciences, technology, and policy. Interdisciplinary dialogue is therefore essential. This conference provides an exceptional platform for the exchange of ideas that integrate scientific understanding—from botanical research to technological innovation—fostering holistic and creative solutions for sustainable development.

By focusing on the "Pathway to Viksit Bharat," the conference aligns academic discussions with the nation's developmental vision. I am confident that the research shared and compiled in the Souvenir of Abstracts will inspire new perspectives, strengthen interdisciplinary cooperation, and contribute meaningfully to future policy and practice.

I warmly welcome all distinguished participants and wish this International Conference great success.

Dr Pinky Prasad

Convener

Head, Department of Botany
Patna Women's College



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Message

It gives me great joy to welcome all the participants, scholars, and guests to the *International Conference on "Bridging Disciplines for Resilience and Sustainability: A Pathway to Viksit Bharat"*, organized by the Department of Botany, Patna Women's College (Autonomous), Patna University, in collaboration with *The Indian Science Congress Association, Patna Chapter*.

In today's rapidly changing world, resilience and sustainability have become more than just academic themes—they are essential values guiding our journey toward a progressive and inclusive *Viksit Bharat*. This conference brings together brilliant minds from diverse fields, united by a common purpose: to explore innovative ideas, share experiences, and co-create knowledge that can shape a better future.

Each abstract compiled in this volume represents a spark of curiosity, dedication, and hope. Together, they reflect our collective commitment to interdisciplinary learning and sustainable progress. I sincerely congratulate all contributors for their valuable work and thank them for enriching this platform with their insights.

Organizing such an event is always a journey of collaboration and shared passion. I express my heartfelt gratitude to the organizing team, our collaborators, and every participant whose enthusiasm has transformed this vision into reality.

May this conference ignite new partnerships, inspire deeper understanding, and strengthen our shared resolve to work for a resilient and sustainable tomorrow.

With warm regards and best wishes,

Dr. Urvashi Sinha

Co-Convenor

Assistant Professor, Department of Botany
Patna Women's College



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Message

It gives me immense pleasure and pride to welcome all the eminent dignitaries, invited speakers, academicians, researchers, and students to this International Conference on **“Bridging Disciplines for Resilience and Sustainability: A Pathway to Viksit Bharat,”** organized by the Department of Botany, Patna Women's College, Autonomous, Patna University, Patna.

The theme of the conference beautifully aligns with India's vision of Viksit Bharat 2047, emphasizing the integration of science, innovation, technology, and social responsibility for a sustainable and resilient future. True resilience and sustainability demand collective effort — bridging not only academic disciplines but also the gap between knowledge and action, between local and global perspectives.

This conference provides a platform for sharing pioneering research, best practices, and policy insights that can guide us toward achieving environmental balance, social equity, and economic progress. Through the synergy of ideas and collaboration among scholars from diverse domains, we hope to inspire a transformative approach to sustainable development and environmental stewardship.

I take this opportunity to express my sincere gratitude to our respected Principal, Dr. Sister Maria Rashmi A.C Chairperson for their continuous support and encouragement. A special note of appreciation goes to the organizing committee, faculty, research scholars, and student volunteers whose hard work and dedication have been the backbone of this event.

May this conference ignite new perspectives, foster lasting partnerships, and inspire every participant to contribute meaningfully to building a resilient and sustainable Viksit Bharat.

Wishing all delegates and participants an enriching, fruitful, and memorable academic experience.

Piyush Kumar Rai

Dr. Piyush Kumar Rai

Organising Secretary

Assistant Professor, Department of Botany
Patna Women's College

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DECLINE IN BUTTERFLY POPULATION: A SMALL CASE STUDY DUE TO CLIMATE CHANGE AND MICROPLASTIC INFLUENCE

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Abstract

Butterflies are one of the most beautiful and widely distributed arthropods in India. Butterflies are ecto-thermal animals, they are highly sensitive to temperature changes which make them ideal model to study the effects of climate change. Excessive heat and open garbage disposal especially in semiurban and rural areas contribute to large amount release of microplastic in the environment. Butterflies play an important role as a pollinator and also serves as prey for other animals in higher tropic levels. During nectar foraging, butterflies can inadvertently accumulate large amounts of microplastics.

The study area, rich in diverse wild flowering plants like Tacoma, giant milkweed, lantana, railway creeper etc provided valuable data collected over two seasons. The observations revealed a sharp decline in both the number of species and overall butterfly populations. The three most observed species — the Common Emigrant, Tree Yellow, and Indian Red Admiral — showed sharp decline in population, with the Indian Red Admiral being rarely spotted in the most recent season. Increase temperature might also increase the rate of release of microplastics from the open garbage dumps.

Both climate change and the high concentration of microplastics in the environment, despite the presence of sufficient floral blooms, have a negative impact on butterfly populations. These factors reduce their survival rate as well as their fecundity.

The study emphasizes the need for sustainable and effective mitigation strategies to reduce the impact of climate change and microplastic contamination on butterfly diversity and abundance.

Especially simple and achievable actions such as enforcing an effective ban on single-use plastic products and ensuring the safe and proper disposal of garbage, rather than dumping it along roadsides, can make a significant difference.

Keywords: butterfly, microplastic, garbage disposal, high temperature.

CHEMISTRY MEETS AYURVEDA: UNDERSTANDING THE PHYTOCHEMICAL AND PHARMACOLOGICAL POTENTIAL

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Abstract

Ayurveda, an ancient Indian system of medicine, has long utilised plants and their derivatives to promote health and wellness. Modern chemistry has enabled the identification and characterisation of phytochemicals

responsible for the therapeutic effects of these traditional remedies. It explores the intersection of chemistry and Ayurveda, highlighting the phytochemical and pharmacological potential of Ayurvedic herbs. Integrating structural and computational biology facilitates the identification of leads, thereby providing invaluable insights into how phytochemicals interact with potential targets in the body. At its core, phytochemistry examines the diverse array of chemical compounds found in plants, encompassing primary metabolites such as carbohydrates, proteins, and lipids, as well as secondary metabolites including alkaloids, flavonoids, terpenoids, and phenolic compounds. These secondary metabolites often serve as defence mechanisms for plants against pathogens, predators, and environmental stressors. we will discuss the role of advanced analytical techniques, such as FTIR, UV-Vis, HPLC, and mass spectrometry, in identifying and quantifying bioactive compounds in Ayurvedic herbs. The pharmacological potential of these phytochemicals will be examined, including their antioxidant, anti-inflammatory, and antimicrobial properties. The paper will also highlight the importance of standardisation and quality control in ensuring the efficacy and safety of Ayurvedic formulations. Examples of Ayurvedic herbs with promising phytochemical and pharmacological profiles will be reported, including neem, tulsi, and curry.

By bridging the gap between traditional Ayurvedic practices and modern chemistry, this paper aims to provide a deeper understanding of the therapeutic potential of Ayurvedic herbs and their potential applications in modern medicine. This knowledge can inform the development of novel, evidence-based therapeutic agents and promote a more holistic approach to health and wellness.

Key Words: Ayurveda, Chemistry, Drugs, Indian Knowledge

HOW AUXIN DECIDE? ROOT OR NOT ROOT IN STEM CUTTING VEGETATIVE PROPAGATION

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Abstract

Root system architecture plays a critical role in plant fitness by determining below-ground resource acquisition. Auxin, a central hormone in root development, regulates a complex network of biosynthesis, transport, and signalling pathways that control root meristem maintenance, cell division, lateral root initiation, and gravitropic setpoint angle (GSA). These processes enable root system plasticity in response to environmental cues. However, in many commercially valuable woody species, adventitious root (AR) formation is recalcitrant, limiting vegetative propagation efforts. While auxin's role in primary and lateral root development is well characterized in *Arabidopsis*, the molecular basis for genotypic variation in AR competence remains poorly understood in woody plants. Here, we performed cambium-specific transcriptomic profiling of stem cuttings from hybrid aspen T89 (difficult-to-root) and hybrid poplar OP42 (easy-to-root), alongside transgenic validation of key regulators. OP42 exhibited elevated expression of reactive oxygen species (ROS) scavenging genes and more extensive transcriptional reprogramming, including lower expression of the negative regulator *PttMYC2*. Transgenic analyses confirmed *PttMYC2.1* and *PttARF17.1* (Auxin Response Factor) as suppressors

of AR formation. These findings connect auxin-related signaling with redox homeostasis and transcriptional regulation, offering new insights into the molecular determinants of AR recalcitrance and providing targets for improving clonal propagation in woody species,

Keywords: Auxin, Adventitious root, Cambium, Transcriptomics, Transgenic

COMPARATIVE ANALYSIS OF ELAEOCARPUS- TREATED VS UNTREATED CANCER CELLS ON LIPID PEROXIDATION IN DMBA-INDUCED BREAST TUMOR RATS

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Abstract

Elaeocarpus ganitrus, widely referred to as Rudraksha, is a revered medicinal plant that has been respected in traditional medicinal practices for a long time. The Rudraksha fruit has alkaloids, flavonoids, tannins, triterpenes, carbohydrates, and cardiac glycosides (Ravipadma et al.,2025). They also include rudrakine, an alkaloid that has been recently identified, Rudrakine is a chemical component derived from the rudraksha tree and is categorized as an indolizidine alkaloid with notable biological effects. Indolizidine alkaloids serve as a strong inhibitor of both α and β -glucosidases. Synthetic indolizidinone compounds exhibited cytotoxic effects on human breast cancer cell lines. They are regarded as possible chemotherapeutic agents for cancer, diabetes, viral infections, and immune system deficiencies. Recent pharmacological studies indicate its possible anticancer effects, particularly in treating breast cancer. This review examines the phytochemical components of *E. ganitrus*. It compiles current evidence from in vitro, in vivo research showcasing its antiproliferative, pro-apoptotic, and cytotoxic impacts on breast cancer cell lines (Mehnaj et al.,2024). Overall, the integration of biotechnological tools with molecular-level studies provides a scientific basis for validating the traditional claims regarding *Elaeocarpus ganitrus*. These approaches not only enhance our understanding of its anticancer mechanisms but also contribute to the development of standardized, plant-based therapeutic formulations for the prevention and treatment of various human cancers, particularly breast cancer (Kushwaha et al.,2023).

Keywords: Elaeocarpus, Alkaloids, Rudrakine, Indolizidine, Nanoparticle, Breast Cancer, anticancer

MICROBIAL ACTIVITY: MICROBIAL CONTRIBUTION TO CLIMATE AND ECOSYSTEM

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Abstract

Microbial activity underpins a vast array of biological processes essential to life, ranging from nutrient cycling and organic matter decomposition to symbiotic interactions and disease suppression. Microorganisms like

bacteria, fungi, archaea, and protists play pivotal roles in maintaining ecological balance and driving biogeochemical transformations.

In environmental contexts, microbial biotechnology has revolutionized waste management through bioremediation, where microbes detoxify pollutants in soil, water, and air. Microbial consortia are employed to degrade hydrocarbons, heavy metals, and synthetic compounds, contributing to ecological sustainability. In agriculture, microbes enhance soil fertility, promote plant growth, and suppress pathogens, thereby reducing reliance on chemical inputs and fostering sustainable farming practices.

Technologically, microbial processes are harnessed for industrial applications such as biofuel production, enzyme synthesis, fermentation, and the development of bioplastics. Advances in genetic engineering, synthetic biology, and omics technologies have enabled the creation of tailored microbial strains for specific tasks, including CRISPR based gene editing and metabolic pathway optimization. In medicine, microbial biotechnology supports the production of antibiotics, vaccines, diagnostics, and probiotics, offering innovative solutions to global health challenges.

Microorganisms are foundational to Earth's life-support systems, silently orchestrating processes that regulate climate, sustain ecosystems, and support biodiversity. Their biochemical versatility enables them to cycle nutrients, degrade pollutants, and influence atmospheric composition making them indispensable agents of ecological balance and climate resilience.

Key words: Microbial activity, Biogeochemical cycles, Bioremediation, Genetic engineering, Synthetic biology, Environmental applications Microbial metabolism, Biofuel production, Probiotics, Waste management, Microbial consortia, CRISPR Technology.

ALTERNATIVES OF ANIMAL MODELS FOR BIOMEDICAL RESEARCH: A BIOTECHNOLOGICAL APPROACH

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Abstract

Biomedical research is not possible to do in humans for legal and ethical issues. An animal model is a non-human species that researchers use to study human diseases and test treatments in cases where human experimentation is not possible or unethical. There are animal models of diabetes (Zebrafish, monkey etc.), neurodegenerative diseases (monkey etc.) etc. In preclinical trials of cancer, vertebrate as well as invertebrate models are used. There are several cons to animal research. Experiments on animals use cruel methods of treatment. Numerous animal lives are lost. It is time consuming too. Biotechnological developments have generated alternatives of animal models for biomedical research like in vitro models (organs-on-chips etc.), invertebrate models, in silico models etc. These technologies provide more relatable data and reduce the need for animals thereby aligning with the "3Rs" principle that is reduction, refinement and replacement.

Keywords: biomedical research, vertebrate model, invertebrate model, in vitro model, in silico model, 3Rs.

ENDANGERED MEDICINAL PLANT *PSORALEA CORYLIFOLIA*: TRADITIONAL PHYTOCHEMICAL AND THERAPEUTIC PROPERTIES

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Abstract

Psoralea corylifolia L. (syn. *Psolaria corylifolia*; common name: babchi) is a medicinal plant long used in traditional Asian systems of medicine for dermatological, reproductive and general tonic applications. Increasing habitat loss and overharvesting for pharmaceutical and cosmetic uses have placed wild populations under pressure, prompting concern for its long-term availability. This study synthesizes ethnobotanical records, phytochemical investigations and preclinical pharmacology to (i) document traditional therapeutic claims, (ii) summarize major bioactive constituents, (iii) review in-vitro and in-vivo evidence for key pharmacological activities, and (iv) highlight conservation and sustainable-use priorities.

Methods: A structured review of primary phytochemical and pharmacological literature was undertaken, emphasizing compounds repeatedly reported across studies (coumarins, flavonoids, meroterpenoids, and phenolic lipids). Representative bioassays and mechanisms reported in the literature—antimicrobial, antioxidant, anti-inflammatory, photochemotherapeutic, estrogenic/osteoprotective and anticancer activities—were collated and critically appraised.

Keywords: *Psoralea corylifolia*, babchi, psoralen, bakuchiol, phytochemistry, vitiligo, phototherapy, antioxidant, conservation, sustainable harvest.

ETHNOMEDICAL SURVEY AND DETERMINATION OF TOTAL ALKALOIDS IN COMMON MEDICINAL PLANTS OF PATNA, BIHAR

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Abstract

A large number of plants are being used as medicinal agents by local people, healers and trainees in Bihar, India. The scientific validation of these plants is not satisfactory. The present work aims to explore tradomedical importance and determine the total alkaloids from selected edible plants/parts. Information about 10 edible plant parts were collected from oral interviews with traditional healers of Bihar. Total alkaloids were screened and estimated by standard pharmacognostic procedure. These plant parts were further screened for the presence of alkaloid compounds by TLC screening methods. Useful plant parts were dried and phytochemicals were extracted by suitable methods like maceration, digestion, decoction, infusion, percolation and Soxhlet extraction. Presence of alkaloid was confirmed by Wagner's and Mayor's Test. Total Alkaloid was estimated by Harborne and Baxter method (1983). Maximum alkaloids (approx..30.58%) were present in Moringa leaves while Lemon grass has minimum 14.98%. Thin Layer Chromatography was used for separating

and estimating the amounts of different alkaloids. Range of Rf value were 03 to 07. TLC analysis was carried out to identify and quantify major alkaloid compounds. This study provides valuable data to establish quality control parameters for these important medicinal plants.

Data obtained from preliminary phytochemicals analysis in the present paper provides basic understanding on the rationality of herbal remedies. Thus, knowledge of potent therapeutic value of our daily edible plants would help us to use them more appropriately. This study aimed to conduct a comprehensive phytochemical analysis and pharmacognostic evaluation of these medicinal plants.

Keywords: Traditional healers, ethno-medicine, edible plants, alkaloids, phytochemicals

BIOSYNTHESIS OF SILVER NANOPARTICLES AND ACCESSING ITS EFFECT ON SEED GERMINATION BEHAVIOUR OF *VIGNA RADIATA*

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Abstract

The present study focuses on the green synthesis of silver nanoparticles (AgNPs) using aqueous extracts of *Mimosa pudica* and investigates their impact on the seed germination and early growth behavior of *Vigna radiata* (mung bean). Phytochemical screening of the *M. pudica* extract revealed the presence of bioactive compounds such as saponins, flavonoids, alkaloids, phenols, proteins, and steroids, which likely contributed to the reduction and stabilization of AgNPs. The synthesized nanoparticles were characterized using UV-Vis spectroscopy, Fourier Transform Infrared Spectroscopy (FTIR), and X-Ray Diffraction (XRD). A strong surface plasmon resonance (SPR) peak observed at 430 nm in the UV-Vis spectrum confirmed the formation of AgNPs. FTIR analysis indicated functional groups such as -OH, -NH, and -COO, suggesting the role of plant metabolites in capping and reducing the nanoparticles. XRD patterns displayed distinct Bragg's peaks corresponding to the face-centered cubic structure of silver, confirming crystalline nature.

The biological efficacy of the synthesized AgNPs was assessed by evaluating their influence on seed germination and morphological parameters of *V. radiata* at concentrations of 250 mg/L and 500 mg/L. Compared to the control, seeds treated with 250 mg/L AgNPs showed enhanced germination percentage (80%), seedling vigor index (1300 cm), earlier emergence of the first leaf (3rd day), increased number of leaves, and higher shoot/root ratio (1.73). However, a higher concentration (500 mg/L) exhibited inhibitory effects on several growth parameters including reduced germination (60%), shorter root and shoot lengths, and delayed leaf emergence. These findings indicate that biosynthesized AgNPs can significantly promote seed germination and early seedling growth at lower concentrations but may exert phytotoxic effects at elevated levels. This study highlights the potential of green-synthesized silver nanoparticles in sustainable agriculture while emphasizing the importance of dosage optimization.

Keywords: Silver nanoparticles (AgNPs), Green synthesis, *Mimosa pudica*, *Vigna radiata*, Seed Germination, Phytochemical screening, Plant-nanoparticle interaction.

PRECISION FARMING: SHAPING THE FUTURE OF INDIAN AGRICULTURE

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Abstract

The idea of Precision farming in Indian agriculture is not new and represents a transformative approach intended at enhancing output, sustainability, and resource competence by integrating advanced technologies, algorithms and data-driven practices. This farming technique applies tools such as GPS, remote sensing, Internet of Things, drones, aerial imagery and AI to optimize inputs like irrigation, fertilizers, and pesticides, thereby reducing waste and ecological impact while boosting crop yield and value. India's agricultural zone is characterized by diverse agro-climatic zones and smallholder farming systems, presents unique challenges and opportunities for precision farming adoption and implementation. The current scenario of precision farming in Indian agriculture is noticeable by a growing awareness and steady uptake of machinery and technology, supported by government initiatives and programmes, private sector innovations, and research institutions. Despite its potential, adoption of precision farming is limited due to factors such as high initial investment, lack of technological knowledge, uneven landholdings, and underdeveloped infrastructure. The amalgamation of inexpensive sensors, mobile based applications, and localized advisory services is serving to overcome these barriers, particularly in progressive farming communities. States like Maharashtra, Punjab and Andhra Pradesh has emerged as pioneer in precision agriculture adoption owing to farmer friendly policies and conventions. Overall, the scenario of precision farming reflects an affirmative inclination towards development of smart farming in India, which can be effectively enhanced through proper guidelines, education, and public-private alliances. Precision farming is emerging as one of the best practices that help in sustainable agriculture, global food security, and have the ability to climate flexibility, making it as a critical agent for the upgrading of Indian farming system and practices.

Keywords: Smart agriculture, Precision farming, Machine learning, Artificial intelligence, Drone surveillance.

ADVANCING INFANT NUTRITION THROUGH RESEARCH COMMERCIALIZATION: A COMPARATIVE STUDY OF MILK TYPES

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Abstract

Milk serves as one of the most vital components of human nutrition, particularly during infancy when physiological growth and cognitive development are at their peak. This study aims to evaluate and compare the physicochemical and nutritional properties of human breast milk, cow milk, goat milk, and infant formula, with the objective of identifying compositional variations and assessing their implications for nutritional adequacy and potential commercialization.

The findings reaffirm that human breast milk remains the benchmark for optimal infant nutrition, offering a balanced profile of macronutrients and micronutrients that promote digestion, immunity, and neurodevelopment. Goat milk demonstrates favourable digestibility and a rich mineral profile, making it a suitable alternative in specific clinical contexts such as lactose intolerance. Cow milk, while nutritionally dense, exhibits higher protein and casein content, which can impede infant digestion. Infant formula, developed through scientific innovation, closely approximates the macronutrient composition of breast milk but continues to lack its dynamic bioactive properties.

From a commercialization perspective, this comparative research holds considerable relevance. The study contributes valuable insights that can inform the development of next-generation infant formulas and functional dairy products. In conclusion, this research highlights the critical role of scientific inquiry in bridging natural nutrition and industrial application. Through continued interdisciplinary collaboration, the commercialization of such research can advance both public health outcomes and innovation in nutritional biotechnology.

Keywords: Human breast milk, cow milk, goat milk, infant formula, industrial application.

IMPACT OF PREDATOR SELF-CONTROL ON A PREY-PREDATOR MODEL WITH GROUP HUNTING AND A STRONG ALLEE EFFECT

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Abstract

Predator cooperative hunting enhances the per capita consumption rate as predator density rises. This phenomenon influences predator extinction dynamics in prey-predator interaction models, particularly when predator populations are low. Such behaviour reflects the presence of an Allee effect in the predator's growth rate. Here, we incorporate self-limitation of predators into the predator growth equation within a Gause-type model, featuring a generalized Type II functional response and a strong Allee effect in the prey growth equation. We provide a detailed analysis of the existence of boundary equilibria. The intersection of non-trivial prey and predator nullclines in the positive quadrant determines the number of interior equilibria. We perform stability analysis of these equilibria based on the eigenvalues of the Jacobian matrix. Importantly, we observe that initial conditions play a crucial role: low initial prey density leads to total extinction, whereas high initial prey density can result

in predator extinction despite initially high prey concentration. The varying intensity of self-limitation produces interesting model behaviors. We further investigate the model's dynamics through bifurcation analysis, revealing the occurrence of both Hopf bifurcation and saddle-node bifurcation in terms of predator self-limitation.

Keywords: Functional response, Self-limitation, cooperative hunting, Allee effect, Bifurcations Analysis.

INTEGRATION OF IOT MACHINE LEARNING FOR EARLY DETECTION OF CROP DISEASES

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Abstract

The integration of Internet of Things (IoT) and Machine Learning (ML) presents a transformative approach for the early detection of crop diseases, addressing critical challenges in modern agriculture. IoT devices, including sensors and imaging tools, enable continuous, real-time monitoring of crop health by collecting diverse environmental and physiological data such as temperature, humidity, soil moisture, and leaf imagery. Machine Learning algorithms analyze this vast and complex data to identify subtle patterns and anomalies indicative of disease onset before visible symptoms appear. This synergy enhances the precision and timeliness of disease diagnosis, facilitating proactive interventions that reduce crop losses and optimize resource use. Advanced ML models, such as convolutional neural networks and ensemble classifiers, have demonstrated high accuracy in distinguishing between healthy and diseased plants under varying field conditions. Moreover, the use of IoT for automated data collection reduces both human error and labor expenses, while cloud-based systems facilitate scalable data processing and informed decision-making. This integration also enables predictive analytics, allowing for the anticipation of disease outbreaks by analyzing environmental patterns and historical data. However, challenges persist in maintaining data quality, ensuring interoperability among diverse IoT devices, and achieving model generalization across various crops and regions. Despite these challenges, continuous progress in sensor technology, edge computing, and the explainability of machine learning models is bolstering system reliability and increasing farmer confidence. This comprehensive framework offers great potential for sustainable agriculture by facilitating prompt disease control, enhancing the quality of yields, and supporting food security. Future studies should aim to create standardized procedures and intuitive interfaces to encourage widespread use among farmers and agronomists.

Keywords: Internet of Things (IoT), Machine Learning (ML), crop disease detection, early warning system, sensor networks, precision agriculture, convolutional neural networks, predictive analytics, sustainable agriculture, real-time monitoring.

EXPLORATORY DATA ANALYSIS OF WATER AND ENVIRONMENTAL SANITATION IN RURAL BIHAR: INSIGHTS FROM MISSION ANTYODAYA 2020

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Abstract

Access to safe drinking water and adequate sanitation is vital to health, dignity, and sustainable rural development. In Bihar, one of India's most densely populated and socio-economically challenged states, these

services remain key development priorities despite several policy interventions. This study presents an exploratory data analysis of Gram Panchayat-level information from the Mission Antyodaya 2020 survey, focusing on water and environmental sanitation in rural Bihar.

The analysis examines indicators such as piped water systems, household connections, community toilets, drainage, waste disposal, and rainwater harvesting structures. Findings indicate mixed progress: about 72 percent of Gram Panchayats reported operational piped water schemes, yet only 47 percent of households had individual connections, reflecting a major infrastructure-access gap. Sanitation coverage improved under Swachh Bharat Mission, but one-third of Gram Panchayats still had households without sanitary toilets. Environmental infrastructure remained weak, as only 40 percent had pucca drainage and 18 percent had systematic waste management facilities. Rainwater harvesting structures were present in just 17 percent of Gram Panchayats, pointing to limited water conservation efforts.

District-level comparisons revealed stark regional disparities, with Patna and Nalanda performing significantly better than districts in northern Bihar. Bivariate analysis showed positive relationships between active Village Water and Sanitation Committees and waste management facilities, and between access to piped water and sanitation coverage, emphasizing the benefits of integrated infrastructure development.

The study demonstrates the usefulness of Mission Antyodaya data in capturing ground realities and guiding local planning under the Gram Panchayat Development Plan framework. It recommends prioritizing drainage and waste management, strengthening community-led water governance, and adopting district-specific strategies to address spatial disparities in service delivery across rural Bihar.

Keywords: Mission Antyodaya, Rural water and sanitation, Bihar, Gram Panchayat, Jal Jeevan Mission, Swachh Bharat Mission, Infrastructure gap.

PLANETARY HEALTH DIET AND ENVIRONMENTAL SUSTAINABILITY: GLOBAL AND INDIAN PERSPECTIVE

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Abstract

The Planetary Health Diet (PHD) offers a paradigm for dietary transformation aligned with environmental sustainability as global food production and consumption patterns exert increasing pressure on natural resources. This systematic literature review evaluates the effects of adopting the PHD on key environmental management indicators, including greenhouse gas emissions, land and water use, and biodiversity outcomes, with particular emphasis on global and Indian contexts. A systematic literature search was conducted following PRISMA guidelines using PubMed, Scopus, Web of Science, and Science Direct databases for studies published between 2010 and 2025. Eligible studies included modelling analyses, life cycle assessments, and empirical studies that measured the environmental impact of dietary shifts toward the PHD. Thirty-eight studies met inclusion criteria. Evidence shows that global adoption of the PHD could reduce food related greenhouse gas

emissions by 40 – 75 per cent, agricultural land use by up to 50 per cent, and freshwater withdrawals by approximately 20 – 25 per cent. Positive effects on soil health, ecosystem resilience, and biodiversity conservation were also reported. However, regional disparities persist; in India and other low and middle income countries, challenges include limited food diversity, socio-economic constraints, and dependence on staple based diets. The review underscores the need for region specific adaptations that integrate local crops, traditional diets, and sustainable farming practices. In conclusion, the PHD represents a practical pathway for integrating nutritional goals with environmental stewardship. Its adoption can play a transformative role in climate action and resource management, provided that implementation strategies are locally contextualized and equity focused.

Keywords: Environmental Management, Sustainable Nutrition, Climate Change, Green House Emissions, Local Adaptations

AI IN DRUG DISCOVERY: TARGET IDENTIFICATION TO CLINICAL DEVELOPMENT

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Abstract

Artificial intelligence has reshaped the drug-discovery landscape from pinpointing targets all the way through to steering clinical development. In the earlier days, drug discovery costed billions of dollars stretched across years of research and still left a high failure rate. Today AI takes off that burden by analyzing genomic, proteomic and chemical data bases identifying and validating therapeutic targets. Machine-learning and deep-learning models point out hidden patterns and mark potential target genes or proteins. Among the breakthroughs, AlphaFold stands out for having revolutionized the Structural Biology by predicting the 3D protein-structure with near experimental accuracy. That breakthrough makes it possible to run screens of millions of compounds within days and to guide structure-based drug design with a precision that was out of reach. AI tools further assist in optimizing molecular properties, predicting absorption, distribution, metabolism, excretion, and toxicity (ADMET) profiles, and improving lead selection with reduced laboratory experimentation. Artificial intelligence (AI) has quietly become an important ally which takes a drug from a lab to a patient's table. It helps identify the right patient groups, design flexible clinical trials, and predict treatment outcomes by combining real-world data with modern biological insights. Successful examples like Halicin, DSP-1181, and INS018_055 show how AI can bring potential medicines to human trials much faster than traditional research methods. Taken together, AI has helped close the gap between computer predictions and real clinical success. Although challenges such as data quality, model clarity, and regulatory approvals remain, AI continues to reshape drug discovery. It is guiding the pharmaceutical world towards a smarter, faster, and more evidence-based future of medicine.

Keywords: Proteomic, Genomic, Halicin, DSP-1181, INS018-055, AlphaFold stands.

SAFEGUARDING GENOMIC DATA MAKING USE OF QUANTUM NEURAL NETWORKS

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Abstract

Genomic research encompasses study of genetics using computation and data science. It includes genomic sequencing by which data of DNA/RNA sequences are collected. The datasets are then analysed applying bioinformatics, machine learning, and increasingly quantum computing to detect patterns in massive datasets. In many of these analyses, the genomic data are stored in public databases. This has posed concerns on how to keep the data safe from any cyber-attacks and data breaches.

In the current era, there has been a rapid increase in employing Quantum technology to different arenas of research. Quantum Neural Networks (QNNs) offer a promising frontier for safeguarding genomic data by combining the pattern recognition power of neural networks with the computational advantages of quantum mechanics. This emerging field is particularly relevant for privacy-preserving biomedical applications. These are basically hybrid models that integrate principles of quantum computing (like superposition and entanglement) with classical neural network architectures. These have the capability to process high-dimensional data efficiently, learn complex patterns and leverage quantum states to encode and manipulate data in ways classical systems cannot. In the present paper, the different methods for protecting genomic data is discussed with emphasis on QNNs.

Keywords: Genomic sequencing, Quantum computing, Neural networks, encryption.

EXTRACTION OF ANTIOXIDANTS FROM CITRUS PEEL: A SUSTAINABLE APPROACH

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Abstract

India is the third largest producer of citrus fruits after China and Brazil. Many industries are based on these citrus fruits and is a key source for products like juice, jam, squash, peel oil, and citric acid, which have both domestic and international markets. These industries produce huge amount of solid fruit waste as peels, pulp and seeds. The peel waste alone accounts for approximately 50% of total wet fruit mass. The citrus peel is a good reservoir of many bioactive compounds, many of which have antioxidative properties. Among them are antioxidant enzymes, flavonoids, carotenoids, ascorbic acid and essential oils. Antioxidants are the biomolecules which scavenges the living systems from the harmful reactive oxygen species generated during various metabolic processes. These reactive species are responsible for the oxidation of organic biomolecules such as fatty acids in membrane lipids, oxidation of proteins, DNA and RNA and thus causing the functional and structural damage to many cell organelles and consequently affecting the biological system at cellular and tissue level. Many diseases like cancer, atherosclerosis, arthritis, Parkinson's and Alzheimer's disease are associated with oxidative stress and are the leading cause of fast ageing and cell death. Both synthetic and natural antioxidants are used in cosmetics, pharmaceuticals and food industries. Researchers are looking for

some natural source of antioxidants which are eco-friendly and cost effective. Extraction of antioxidants from citrus peel can serve the purpose and research is going on in this field but more research is needed for effective extraction to increase the yield of antioxidants from the peel of citrus fruits.

Key words: citrus peel, bioactive compounds, antioxidant, extraction, natural source

THE MICROBIOME: FOUNDATION OF SUSTAINABLE AGRICULTURE, SOIL HEALTH AND HUMAN HEALTH

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Abstract

Plants are associated with a myriad of microbial species, together called microbiome. The plant microbiome, encompassing diverse microbial species associated with root systems, plays a pivotal role in enhancing plant growth and health. These microbial species interact with plants in the rhizosphere and perform multiple plant growth-promoting activities like nutrient fixation and solubilization, stress management, phytohormone production, plant phenology, improved yield and many other positive effects. Numerous plant species forms symbiotic association with microbes and draw the benefit of mineral nutrient supply with the expense of minimal energy, and their distribution is governed by nature and the number of root exudates, crop species and cultivars. Potent microbes are used as biofertilizers, bio-stimulants and biocontrol agents in agriculture. Thus, microbiome offers a sustainable alternative to conventional agricultural practices, reducing reliance on chemical fertilizers, pesticides and herbicides, which pose risks to environmental health. Additionally, sustainable approaches like crop rotation, green manuring, conservation tillage and agroforestry enhance microbial diversity, resulting in improved soil health, reduced pest prevalence and increased carbon sequestration, all of which are essential for maintaining healthy soils and productive agroecosystems. Microbial rich soil increases nutrient density in fruits, micronutrient content in crops and thus influences human immune responses and emotional well-being. Thus, microbiome aids in promoting sustainable agriculture which accomplishes a safe environment, which in turn manifests positively on human health. So, harnessing the potential use of soil microbiota in agriculture is considered as a most fruitful and long-term solution to environmental pollution, food security and human health.

CYBERSECURITY AND DATA PRIVACY CHALLENGES IN GENOMIC RESEARCH: A COMPREHENSIVE STUDY

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Abstract

This study provides a comprehensive examination of the cybersecurity and data privacy challenges in genomic research, emphasizing their critical role in advancing India's scientific, ethical, and developmental objectives

under the Viksit Bharat 2047 vision. Employing a mixed-method approach that integrates quantitative surveys, qualitative expert interviews, and AI-based data analysis, the research identifies significant vulnerabilities in genomic data protection across research institutions. Results reveal moderate levels of cybersecurity preparedness, limited adoption of advanced AI-driven security frameworks, and persistent risks from phishing, ransomware, and unauthorized data access. The SWOT and thematic analyses further indicate systemic weaknesses in data governance, ethical compliance, and workforce capacity, alongside strong government initiatives and opportunities for innovation through AI, blockchain, and interdisciplinary education. Expert perspectives underscore that genomic cybersecurity must evolve from a purely technical concern to a multidimensional framework encompassing ethical governance, policy integration, and educational reform. The study highlights the urgent need for unified national genomic data governance policies aligned with the Digital Personal Data Protection Act (DPDP) 2023 and global standards like GDPR. It concludes that building a secure and ethical genomic ecosystem requires the integration of AI, blockchain, privacy-by-design principles, and interdisciplinary learning to enhance resilience, public trust, and scientific excellence. Ultimately, this research positions cybersecurity and ethics as foundational pillars for achieving a secure, sustainable, and innovation-driven genomic future aligned with India's Viksit Bharat mission.

Keywords: Genomic Research, Cybersecurity, Data Privacy, Ethical Governance, Viksit Bharat 2047

ROLE OF ELECTRON IMPACT IONIZATION CROSS-SECTIONS ON HYDROGEN ATOM AND H⁺ (HYDROGEN IONS)

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Abstract

We measured electron-impact ionization cross sections for hydrogen-like iron and molybdenum using an electron-beam ion trap (EBIT). These one-electron ions are ideal benchmarks for testing collision theory and for improving models of high temperature plasmas, so precise experimental data are essential.

Traditionally, crossed beam experiments have supplied reliable cross sections for low Z systems (up to $Z = 8$). For heavier ions, however, trap based techniques such as EBITs are better suited because they allow us to produce, confine, and study highly charged ions with excellent control. In our work we scanned the electron-beam energy started from 13.5 keV for hydrogen like iron and started from 50 keV for hydrogen like molybdenum, chosen to cover the ionization thresholds and the region where direct ionization dominates.

We carefully calibrated the electron energy and accounted for background and detector effects to extract absolute cross sections with high accuracy. The new data are compared with current theoretical predictions, and for molybdenum we also compare with earlier experimental results. Building accurate, high precision cross section datasets is crucial both for refining theoretical models and for reliable plasma and astrophysical diagnostics.

PHYTOPLANKTON DIVERSITY OF LOCAL POND OF CHAPRA DISTRICT IN RELATION TO ITS PHYSICHO-CHEMICAL CHARACTERISTICS

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Abstract

Chapra (**Saran District**) is one of the thirty-eight districts of Bihar state, India. The Saran district occupies an area of 2,641 square kilometers (Coordinates: 25.7811° N, 84.7543° E). There is a local pond situated in middle of the town, known as Rajendra Sarovar. An ecological study of this pond was made with respect to its physico-chemical characteristics and growth of planktonic algae, as earlier it has not been done. Physico-chemical analysis of the pond water exhibited good amount of alkalinity, nitrate and phosphate which favour growth of phytoplanktons, which finally resulted in eutrophication of lake and thus elevated level of BOD and COD (greater than permissible limits). The phytoplanktons chiefly comprised of family Chlorophyceae, Cyanophyceae and Bacillariophyceae and the Shannon –Weiner Diversity was calculated.

Keywords: Pond, Alkalinity, Nitrate, Phosphate, BOD, COD, Phytoplanktons, Diversity.

COMPARATIVE ANALYSIS OF ELAEOCARPUS- TREATED VS UNTREATED CANCER CELLS ON LIPID PEROXIDATION IN DMBA-INDUCED BREAST TUMOR RATS

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Abstract

Elaeocarpus ganitrus, widely referred to as Rudraksha, is a revered medicinal plant that has been respected in traditional medicinal practices for a long time. The Rudraksha fruit has alkaloids, flavonoids, tannins, triterpenes, carbohydrates, and cardiac glycosides (Ravipadma et al.,2025). They also include rudrakine, an alkaloid that has been recently identified, Rudrakine is a chemical component derived from the rudraksha tree and is categorized as an indolizidine alkaloid with notable biological effects. Indolizidine alkaloids serve as a strong inhibitor of both α and β -glucosidases. Synthetic indolizidinone compounds exhibited cytotoxic effects on human breast cancer cell lines. They are regarded as possible chemotherapeutic agents for cancer, diabetes, viral infections, and immune system deficiencies. Recent pharmacological studies indicate its possible anticancer effects, particularly in treating breast cancer. This review examines the phytochemical components of *E. ganitrus*. It compiles current evidence from in vitro, in vivo research showcasing its antiproliferative, pro-apoptotic, and cytotoxic impacts on breast cancer cell lines (Mehnaj et al.,2024). Overall, the integration of biotechnological tools with molecular-level studies provides a scientific basis for validating the traditional claims

regarding *Elaeocarpus ganitrus*. These approaches not only enhance our understanding of its anticancer mechanisms but also contribute to the development of standardized, plant-based therapeutic formulations for the prevention and treatment of various human cancers, particularly breast cancer (Kushwaha et al., 2023).

Keywords: Elaeocarpus, Alkaloids, Rudrakine, Indolizidine, Nanoparticle, Breast Cancer, anticancer

EXTRACTION OF NUTRACEUTICAL LYCOPENE FROM SUN DRIED TOMATOES AND ITS CHARACTERIZATION AND FORMULATION IN ITS NANOFORM

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Abstract

Nutraceutical are food derived substances that provide no. Of medicinal benefits and prevent fatal disease. Lycopene is such a nutraceutical component that belongs to carotenoid family. They are predominantly found in tomatoes. The main purpose of our work is to extract lycopene, a nutraceutical component from tomatoes. This research align with the principles of circular economy and sustainable development. The lycopene content in tomatoes typically ranges from 70-130mg/kg and depends on the variety, geographic location, technique of cultivation, climatic condition and degree of ripeness of tomato fruit.

In this era of disease prone lifestyle, lycopene has drawn the attention of the scientific community only in the last few decades due to both it's biological and Physiochemical characteristics as well as for the absence of toxicity and genotoxicity. The main health benefits of lycopene are mediated due to its binding capacity with the free radicals and also inhibits the oxidation phenomena and dna damage and due to its powerful antioxidant activity, lycopene reduces the risk and onset of different types of cancers in human. This nutraceutical also exhibits protective or preventive effects in cardiovascular disease, osteoporosis, diabetes and several other metabolic disorders related to oxidative stress. Therefore, we need to include nutritionally functional food in our diet. This research work is done mainly to synthesize nanoparticle lycopene that improves lycopene stability and delivery to targeted area and hence enhancing it's antioxidant, anticancer and other biomedical properties. We extracted the lycopene by solvent extraction method(maceration) from sun dried tomatoes and perform characterization by UV- Vis spectroscopy, FT-IR spectroscopy, NMR spectroscopy and also performed HPLC. For the conversion of lycopene in its nanoform we performed solvent evaporation method followed by Lyophilization to solidify the lycopene within the nanoparticle and its characterization include SEM, AFM, HPLC, XRD. FT-IR and UV-Vis spectroscopy.

Keywords: Nutraceutical, Genotoxicity, Antioxidant, Carotenoid, Maceration, Lyophilization.

GREEN CHEMISTRY: A SUSTAINABLE REVOLUTION IN CHEMICAL SCIENCES

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Abstract

Green Chemistry has emerged as a transformative scientific approach dedicated to reducing the environmental and health impacts associated with chemical processes and products. Grounded in the twelve principles of green chemistry, this field emphasizes the design of safer chemicals, renewable feedstocks, energy-efficient synthesis and the elimination of toxic reagents and waste. Recent technological advances including catalysis, biodegradable materials, solvent free reactions and alternative energy sources like microwave and ultrasonic irradiation, have provided powerful strategies for achieving sustainability in both laboratory and industrial settings. Green chemistry not only addresses global challenges such as pollution, climate change and resource depletion but also enables innovative growth through ecofriendly product development. This research-driven movement continues to reshape chemical sciences by utilising scientific innovation with environmental responsibility, ultimately paving the way for a cleaner, safer and more sustainable future.

Keywords: Green chemistry, Sustainability, Twelve principles, Biodegradable materials and Environmental safety.

BIOREMEDIATION OF UREA-ENRICHED PADDY FIELDS THROUGH NITROGENASE DEREPRESSED MUTANT STRAINS OF NOSTOC AND ANABAENA

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Abstract

Repeated employment of Urea as nitrogenous fertilizer in the crop fields. Ultimately results in Urea-eutrophication creating soil pollution. On the contrary the Nitrogen-fixing cyanobacteria growing on wet soils have been proved to serve as natural source of non-polluting bio-N-fertilizers. With this view in mind two cyanobacterial species *Nostoc linckia* and *Anabaena oryzae* found growing in rice fields of Barh (Patna) were collected, isolated to unialgal state and grow in Chu10(M) medium in laboratory under standard culture conditions. Their ability to fix nitrogen and serve as bio-N-fertilizer in place of chemical-N-fertilizer during rice cultivation as ascertained (Snehee,2016). The optimum level of Urea-N supporting maximum growth of the cyanobacterial species in culture was found to be 34ppm while their heterocyst differentiation was observed only up to 6.8 ppm. Higher Urea-N levels reduced consecutive growth and suppressed heterocyst differentiation.

N. linckia and *A. oryzae* were treated separately with 120ppm (MIC dose) of MNNG for 30 minutes, thoroughly washed and grown on solid media containing 136ppm Urea-N and 200ppm Sodium-azide (MIC dose). After one month incubation, a few colonies of *N. linckia* and *A. oryzae* appearing on the media were isolated, grown in fresh media containing 136ppm Urea-N. The colonies exhibiting optimum growth with normal heterocyst frequency upto ten successive generations were designated as Nitrogenase-derepressed mutants. The mutants consumed nitrogen from soil supplemented with 136ppm Urea-N retaining their ability to form heterocyst suggesting their utility in bioremediation of Urea eutrophicated paddy fields along with the source of economical and eco-friendly bio-N-fertilizers.

Keywords: Urea-eutrophication, cyanobacteria, bio-N-fertilizer, Sodium-azide

ISOLATION AND IDENTIFICATION OF SPOILAGE MICROORGANISMS FROM MINIMALLY PROCESSED FOOD AS A FOUNDATION FOR FURTHER NATURAL PRESERVATIVE DEVELOPMENT

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Abstract

Microbial spoilage poses a continuous challenge to the shelf life of any food matrix, necessitating for effective and safe natural antimicrobial alternatives to synthetic chemical preservatives. Spoilage microorganisms causes major economic and public health risks for the food industry. This study was aimed to identify predominant spoilage microorganisms in few minimally processed food matrix, providing a foundation for safer natural preservation. Samples were collected from microbially compromised food matrices as, boiled potato salad, semi-boiled pineapple salad, steamed rice and subjected to standard microbiological plating on selective agar media for the isolation and purification of organisms associated with spoilage. Preliminary identification was based on morphological and biochemical tests. Subsequent species level identification was performed using the automated VITEK 2 system. The results successfully identified predominant key spoilage bacterial and fungal agents responsible for the rapid spoilage of experimental food samples as bacterium, *Enterobacter cloacae*, *Klebsiella pneumoniae* and yeast *Candida guilliermondii* in potato, pineapple and steamed rice respectively. These isolates represent the most critical microbial threats to product stability due to their degrading abilities, thereby posing health risk in this food category. In conclusion, the successful isolation and definitive identification of these isolates provide a critical reference set and necessary foundation for the subsequent development phase. Future work will focus on the in-vitro susceptibility testing of natural preservatives, such as plant based extracts against these identified resilient spoilage organisms with the ultimate goal of developing a commercially viable, 'clean label' preservative solution.

Keywords: minimally processed food, spoilage microorganisms, Natural preservatives, *E. cloacae*, *K. pneumoniae*, *C. guilliermondii*.

IN VITRO SUSCEPTIBILITY OF FOOD-BORNE BACTERIA AGAINST *FERULA GALBANIFLUA* AND *OCIMUM CANUM* ESSENTIAL OILS

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Abstract

The escalating challenge of antibiotic resistance has prompted renewed interest in natural antimicrobial agents derived from medicinal plants. This study evaluates the *in vitro* antibacterial activity of essential oils extracted from *Ferula galbaniflua* Boiss. (Apiaceae) and *Ocimum canum* Sims (Lamiaceae) against two common food-borne pathogens, viz. *Bacillus cereus* and *Escherichia coli*. These plants have been traditionally used in Indian medicine for their therapeutic properties, including as stimulants, carminatives, and antispasmodics. Essential

oils were extracted via hydro-distillation using Clevenger's apparatus and tested using disc diffusion, minimum inhibitory concentration (MIC), and minimum bactericidal concentration (MBC) methods according to CLSI guidelines. Results from disc diffusion assays showed that *Ferula galbaniflua* oil exhibited a zone of inhibition (ZOI) of 32.50 ± 8.42 mm against *B. cereus* and 14.39 ± 2.24 mm against *E. coli*, while *Ocimum canum* oil demonstrated 15.56 ± 2.74 mm against *B. cereus* and 35.00 ± 5.83 mm against *E. coli*. MIC and MBC values further confirmed *Ferula galbaniflua* efficacy against *B. cereus* (MIC: 0.5 mg/mL, MBC: 1.0 mg/mL) and *Ocimum canum* against *E. coli* (MIC: 0.25 mg/mL, MBC: 0.5 mg/mL). Compared to reference antibiotics gentamicin and kanamycin, the oils showed comparable or superior activity in specific cases as *Ferula galbaniflua* against *B. cereus*, while *Ocimum canum* against *E. coli*. These findings suggest that these essential oils could serve as natural alternatives to combat antibiotic-resistant food-borne infections, highlighting their potential in food preservation and therapeutic applications. Further studies on their chemical constituents and in vivo efficacy are recommended.

Keywords: Essential oils, Antibacterial activity, *Ferula galbaniflua*, *Ocimum canum*, *Bacillus cereus*, *Escherichia coli*, Antibiotic resistance, Food-borne pathogens

ORCHIDOID MYCORRHIZAL COLONIZATION, DIVERSITY AND PLANT GROWTH PROMOTING POTENTIAL ASSOCIATED WITH *CREPIDIUM ACUMINATUM* (D.DON) SZLACH: AN ENDANGERED MEDICINAL ORCHID OF THE ASHTAVARGA GROUP

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Abstract

Orchidaceae is one of the world's most diversified and large angiospermic families. They are unique among flowering plants due to their highly specialized reproduction and symbiotic relationships with fungi. In Ayurveda, the Ashtavarga group consists of eight important plants found mainly in the Indian Himalayas, four of which belong to the Orchidaceae family. Among them, *Crepidium acuminatum* (D. Don) Szlach., known as "Jeevak," holds significance due to their ethnomedicinal properties. Despite being a rare and endangered species, studies on its mycorrhizal colonization and associated Orchid Mycorrhizal Fungi (OMF) remain limited. In the present study, mycorrhizal colonization and the diversity of OMF associated with *C. acuminatum* were studied. From Uttarakhand Six different sites were selected: Nainital, Dhanaulti, Mussoorie, Almora, Ranikhet and Pauri. Root samples were collected and further analyzed. A total of 60 fungal isolates were found, 20 isolates were classified under OMF in 4 different genera while the remaining were non mycorrhizal belonging from 20 genera. All the endophytic fungi were screened for plant growth-promoting activity; out of which 54 isolates exhibited phosphate solubilization, 32 isolates secreted siderophores, 38 were capable of ammonia production, and 56 synthesized IAA. Notably, the genera *Tulasnella*, *Fusarium*, *Rhizopus*, and *Ceratobasidium* showed best performance across all plant growth-promoting tests in vitro. Thus, as per the findings of this study, it can be concluded these fungi possess strong potential as plant growth promoters in orchid conservation and cultivation. Further research is underway to evaluate their utility as PGP agents.

Keywords: Ashtavarga, *Crepidium acuminatum*, Endophytic fungi, Orchidaceae, Orchid Mycorrhizal Fungi.

EVALUATING THE GAP BETWEEN NATIONALLY DETERMINED CONTRIBUTIONS (NDCS) AND ACTUAL EMISSION TRAJECTORIES: IMPLICATIONS FOR ENVIRONMENTAL MANAGEMENT IN EMERGING ECONOMICS

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Abstract

The Paris Agreement established Nationally Determined Contributions (NDCs) as a central mechanism for achieving global climate goals; however, a persistent gap remains between pledged commitments and actual emission trajectories, particularly in emerging economies. This paper critically evaluates the magnitude, causes, and implications of this gap for environmental management and sustainable development. Drawing on the latest updates from the UNFCCC (2024–2025) and the IPCC Sixth Assessment Report (AR6), the study finds that current NDCs, even if fully implemented, would result in only a 2.6% reduction in global emissions by 2030 compared to 2019 levels—far short of the 43% reduction needed to align with the 1.5 °C target. Through a comparative analysis of selected emerging economies, the research identifies key constraints, including limited institutional capacity, inadequate financing, technological gaps, and weak policy enforcement mechanisms. The study further explores how fragmented governance structures and insufficient integration of mitigation and adaptation strategies hinder effective environmental management. By assessing both quantitative emission trends and qualitative policy frameworks, the paper underscores the urgent need to strengthen monitoring, reporting, and verification (MRV) systems, enhance access to climate finance, and build domestic capacities for low-carbon transitions. It concludes that bridging the NDC–emission gap requires a transformative approach—linking international commitments with robust national policies, transparent governance, and participatory environmental management. This paper contributes to understanding how emerging economies can operationalize climate commitments more effectively while balancing growth, equity, and environmental sustainability.

TOMATO LEAF CURL VIRUS INFECTIVITY STUDY ON SEVERAL VARIETIES OF TOMATO

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Abstract

Tomato (*Solanum lycopersicum* L.) is one of the economically important crops grown in our country. According to FAO, 2019 we were second largest contributor in tomato production. Although, Bihar contributes only about 5-6% of the total tomato production of India. Tomato is a crucial source of income for the marginal farmers due to its market demand. In last several decades, Tomato leaf curl virus (ToLCV), has emerged as a severe pathogen of tomato, affecting its productivity. ToLCV is vectored by whitefly (*Bemisia tabaci*).

Majority of wild type tomato variety exhibit partial resistance. Thus, to control ToLCV spread, common strategy is to control the vector through insecticide, but it causes environmental pollution. Many private seed companies promote excess use of insecticide to get better productivity and to avoid ToLCV infection, also claims that their variety is tolerant to ToLCV. Therefore, we are presently working on identifying new source of resistance against ToLCV, and to check the performance of some popular varieties against ToLCV, in glass house condition. We have performed infectivity study on Kashi Aman and Kashi Amrit. The infectivity studies is going on to identify ToLCV pathogenicity in several tomato varieties (like Heemsohna, Abhilash, and VNR 1371). The market varieties are being selected on the basis of field survey in Bihar. Later, this research will help farmers to select better variety for cultivation and may also generate valuable data regarding source of resistance in popular market variety. Presently we have shown the breakdown of resistant in tomato variety Kashi Aman, through agro-inoculation of infectious ToLCV clone.

Keywords- ToLCV, Tomato, Resistant variety, Leaf curl disease, Infectivity.

COMPUTATIONAL MODELLING OF LARGE-PORE ION CHANNELS

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Abstract

Computational modeling has become a powerful tool for understanding the structure, dynamics, and permeation mechanisms of large-pore ion channels that mediate the flux of ions and small molecules across cell membranes. Unlike narrow ion channels, eukaryotic large-pore channels such as connexins, pannexins, LRRC8s, and CALHMs exhibit remarkable structural plasticity and complex regulation of permeation. Using molecular dynamics (MD) simulations, our work explores the atomic-level dynamics of connexin hemichannels and gap junctions, revealing how the interplay between pore-lining residues and the conformational flexibility of permeant molecules governs selectivity and transport efficiency. We apply advanced computational techniques, including voltage-driven flux, potential of mean force, and mean first-passage-time analyses, to dissect the energetics and kinetics of molecular transit through wide pores. Our simulations further demonstrate that mutations associated with disease, such as GJC2 variants p.G40S and p.R244P in Cx47, alter pore-lining structure and membrane interactions, impairing junctional coupling and channel assembly. Importantly, we find that ionic and molecular permeation can be uncoupled in connexin hemichannels, suggesting that these proteins may function as hybrid channel/transporter systems. Together, these findings illustrate how computational modeling can uncover dynamic features of large-pore channels inaccessible to experimental methods, providing mechanistic insight into gating, selectivity, and disease-related dysfunction. Such integrative approaches will be essential for elucidating the physical principles of molecular permeation and guiding future experimental and therapeutic studies.

Keywords: Molecular dynamics, CALHMs, GJC2 variants, p.G40S, p.R244P, Cx47.

COMPUTATIONAL ANALYSIS OF SARS-COV-2 SPIKE PROTEIN EVOLUTION IN INDIA REVEALS CHANGES IN RECEPTOR BINDING AND STRUCTURAL ADAPTABILITY

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Abstract

SARS-CoV-2, the causative agent of COVID-19 pandemic, was reported for the first time from Wuhan, China. During the course of the pandemic, this virus mutated rapidly, leading to the emergence of various variants. The virus Spike protein interacts with the host cells via ACE2 protein for its entry into the human cells. The changes in the Spike protein plays important role in infectivity and transmissibility, with severe clinical effects. Understanding the adaptation of SARS-CoV-2 spike protein during the course of pandemic is critical for the development of effective treatments. This study investigates the temporal evolution and structural consequences of mutations in the SARS-CoV-2 spike protein in the isolates reported from India between 2019 to 2025. Analysis of 2,244 sequences revealed progressive diversification across three phases—early (2019–2020), intermediate (2021), and late (2022–2025)—with 580 distinct mutations identified. Mutations clustered primarily within the receptor-binding and N-terminal domains, highlighting adaptive shifts in receptor interaction and structural adaptation. Co-occurrence analysis delineated lineage-specific mutation clusters corresponding to D614G-dominated ancestral strains, Delta-like intermediates (L452R, T478K, P681R), and Omicron-like variants (N501Y, Q498R, N679K). Molecular dynamics simulations revealed an evolutionary transition from stable, high-affinity spike–ACE2 binding in Delta-like variants to increased flexibility and reduced binding strength in Omicron-like strains. Collectively, these findings elucidate the structural and temporal trajectories leading to SARS-CoV-2 adaptation, highlighting the interplay between binding optimization and immune escape, and provide a framework for future studies.

ASSESSMENT OF PHYSIO-CHEMICAL ANALYSIS OF POTABLE WATER SOURCES OF COLLEGES OF PATNA, BIHAR, INDIA

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Abstract

Assessment of drinking water quality is being crucial especially in colleges since student spend most of the time in colleges premises. The aim of this research was to assess physiochemical analysis of potable water sources of colleges of Patna, Bihar (India). A total of 15 samples were analysed for parameters including pH, turbidity, conductivity, total dissolved solids (TDS), Calcium, Magnesium, Chloride, Alkalinity, fluoride, Nitrate, Sulphate and heavy metals including Fe and As following APHA (2017) methods. The findings obtained for each parameter were compared with the standard values established by the World Health Organization (WHO) and Bureau of Indian Standards (BIS) (IS:10500,2012). The values of each parameter were found to be within the

safe limits set, while few sample exhibited higher conductivity and hardness values, indicating mineral contamination and anthropogenic influence. To evaluate the total water quality of colleges of Patna, it is necessary to look into various possible water contaminants, including as chemicals, microbiological and radioactive pollutants, and fluids of human body over an extended period of time.

Keywords: Potable, Physiochemical parameters, WHO, APHA, BIS, Anthropogenic, Microbiological, Radioactive pollutants.

DISSEMINATION OF WEED PLANTS IN BHOJPUR AND THEIR MANAGEMENT

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Abstract

Weed plants are disseminated in Bhojpur primarily through seeds and vegetative parts carried by wind, water, agricultural machinery, and contaminated crop seeds. A comprehensive approach involving cultural, mechanical, and chemical methods is recommended for effective management. In Bhojpur, common weed plants that compete with major crops like wheat and rice include *Phalaris minor*, *Chenopodium album*, *Cyperus rotundus*, and *Parthenium hysterophorus*. Effective management requires an integrated approach that combines preventive measures, cultural practices, and chemical controls. Management strategies in Bhojpur, as promoted by agricultural institutions, combine cultural, mechanical, and chemical methods into an Integrated Weed Management (IWM) approach. Weeds pose a significant threat to agricultural productivity in Bhojpur, a predominantly agricultural district in Bihar, India, causing substantial crop yield and economic losses. The competitive and allelopathic nature of weeds interferes with crop plants for resources like water, nutrients, and sunlight, leading to hindered growth and reduced crop quality. Effective weed management is crucial for sustaining agricultural production in the region, which is dominated by a rice-wheat cropping system.

Common weed species identified in agricultural fields across South Bihar, including Bhojpur, include grassy weeds, broadleaf weeds, and sedges. Dominant species often cited in studies of wheat fields are *Phalaris minor* (a mimicry weed that is difficult to identify and remove manually), *Chenopodium album*, *Lathyrus aphaca*, and *Vicia sativa*. In canal-irrigated areas, problematic species also include *Parthenium hysterophorous* and *Polypogon monspeliensis*. The weed flora, especially in areas like rice fields, may also include sedges such as *Cyperus rotundus*. Challenges to effective weed control persist due to factors like labor shortages for manual weeding, the evolution of herbicide-resistant weeds, particularly *Phalaris minor*, and inadequate access to timely and proper weed management resources. Therefore, the continued adoption of integrated strategies, farmer education, and local research are essential to minimize crop losses and improve the economic viability of farming in the Bhojpur region.

Keywords: Effective management, integrated approach, preventive measures, cultural practices, chemical controls, allelopathic nature, Dominant species.

CONSERVATION OF LAMIACEAE HERITAGE IN MUZAFFARPUR: A SYNTHESIS OF TRADITIONAL KNOWLEDGE AND PHYTOCHEMICAL PERSPECTIVES

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Abstract

Lamiaceae is a family of plants that is a good source of medicine and aroma with a strong ethnobotanical and cultural background. In Muzaffarpur district, Bihar, the species *Ocimum tenuiflorum*, *Mentha arvensis*, *Salvia officinalis*, and *Leucas aspera* have been used in traditional healthcare, household medicine, and in spiritual practices. These plants are used to treat respiratory disorders, skin ailments, fevers, and in some cases, digestive problems. Phytochemical studies show the presence of essential oils, flavonoids, alkaloids, and terpenoids along with some phenolic compounds, thus verifying bioactivity. By connecting traditional wisdom with scientific proof, this work demonstrates the intertwined importance of cultural conservation and biodiversity preservation. To support this perspective, the paper employs a review-based methodology, which summarizes the available records on ethnomedicine and phytochemical research on these plants in order to point out the therapeutic and conservation potential. These findings also support the need for integrated conservation approaches based on ethnobotanical and phytochemical evidence, along with rational and pragmatic use. This will ensure that Muzaffarpur Lamiaceae heritage withstands ecological and socio-economic challenges.

Keywords: Lamiaceae, Traditional knowledge, Phytochemical analysis, Ethnomedicine

ETHNO-VETERINARY MEDICINE FROM SARAN DISTRICT, BIHAR

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Abstract

Since the time immemorial humans are depending on natural resources for full filling their basic needs like food, medicine, shelter etc. Ancient people has given equal importance to health care along with the food and shelter and in doing their own system of medicine. Since livestock was essential component of their livelihood, then started treating cattle by using natural resources. Rearing of cattle goats, fowls, etc are common practices among the rural society of Saran district. Treating the ailments of these domestic animals is done by the application of herbal drugs as the rural communities have their own system of herbal veterinary medicine practiced since time immemorial. The common veterinary disease in this district are swelling of abdomen, running nose, loose motion, intestinal worm, swelling of neck due to cold, suppression of milk mastitis etc. The present study on ethnoveterinary medicine was conducted in the rural reas of Saran districts provide the information about traditional plant uses of 21 plant species belong to 10 angiosperm families. Majority of preparation are from leaves, underground parts, stem, fruit, seed, whole plant and latex. One of the widely distributed plants from this region is *Centella asiatica*, which has been used by livestock owners and farmers for gastric disturbance in animals.

Key Words : Natural resources, Saran, Livestock, Ailments, Herbal drugs, Veterinary.

SOIL MICROBES ISOLATED FROM URBAN AND RURAL REGIONS OF PATNA SHOW PREVALENCE OF MULTIANTIBIOTIC-RESISTANT BACTERIA

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Abstract

The global escalation of Antimicrobial Resistance (AMR) presents a major public health concern. Urbanization, wastewater discharge, and agricultural runoff have increased the prevalence of antibiotic resistant microbes in the soil. This study aimed to evaluate the antibiotic resistance profiles of soil-borne bacteria in both urban and rural areas of the Patna district. Soil samples were systematically collected from four sites—Fatuha Urban, Fatuha Rural, Patna Urban, and Patna Rural—and subjected to bacterial isolation through serial dilution and nutrient agar plating. Pure colonies were obtained via pentagonal streaking, followed by antibiotic susceptibility testing using the Kirby-Bauer disc diffusion method against 22 clinically relevant antibiotics representing diverse mechanisms of action. Among the 78 distinct bacterial isolates recovered, 54 (69.2%) displayed resistance to at least one antibiotic, while 15 strains (19.2%) exhibited multi-antibiotic resistance (MAR), defined by resistance to three or more antibiotic classes. The widespread detection of MAR bacteria across both urban and rural soils highlights the broad distribution of resistant bacteria in those regions. These findings emphasize for continuous environmental surveillance and robust policy interventions to curb the development and spread of MAR microbes and safeguard public health.

Keywords: Antimicrobial resistance; Multiantibiotic-resistant bacteria; Urban; Rural; Environmental surveillance; Public health; Kirby-Bauer method.

IMPACT OF CLIMATE CHANGE, ENVIRONMENTAL MANAGEMENT ON SOIL MYCOFLORA

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Abstract

Global climate change, mainly temperature rise and increased carbon dioxide (CO₂) concentration, is a major concern these days. The inter-annual climatic variability is prominent and significantly influences the agricultural production. Soil productivity is influenced by the amount and activity of beneficial soil microorganisms, which help in degrading the organic matter as well ascertaining the availability of plant nutrients. It is essential to reduce the emission of CO₂ and other major greenhouse gases (GHGs) through the implementation of various strategies in the land use planning and by increasing the soil organic matter by adoption of various techniques which will not only help in reducing the greenhouse gas emissions and mitigating the impact of climate change on beneficial soil microbial community but also allow additional benefits to the farmers in the form of reduced labour, costs, greater efficiency, improved soil quality along with sustainable crop production. Environmental changes are causing shifts in the species distributions on a global

scale and can alter the interactions between the microorganisms within ecosystems. Climate change disrupts the delicate balance of plant-soil ecosystems, which significantly affecting plant health and soil fertility. The crucial role of soil microorganisms in nutrient cycling, plant nutrition, facilitation of plant coexistence, and population regulation could have significant consequences for plant community composition and overall ecosystem function. This study focuses on climate-changes, which directly and indirectly have effects on soil microbes and their interactions with plants. Overall, this study has the potential to contribute to our understanding significantly of climate-changes effects on ecosystem.

Keywords: Ecosystem, Microbial communities, Heat waves, Flooding, Drought, Climate change GHGs Mitigation strategies

BENZIMIDAZOLE AND ITS DERIVATIVES PLAY A SIGNIFICANT ROLE IN ADVANCING GREEN AND HERBAL CHEMISTRY

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Abstract

Benzimidazole and its derivatives have emerged as essential compounds in the evolution of green and herbal chemistry due to their multifunctional chemical structure and environmental compatibility. Structurally, benzimidazole consists of a fusion between benzene and imidazole rings, forming a stable heterocyclic framework capable of sustainable molecular modifications. In recent years, researchers have increasingly emphasized eco-compatible and energy-efficient synthetic strategies, including solvent-free reactions, plant-based catalysts such as *Acacia concinna* or citrus fruit extracts, and Nano catalysts derived from metals like iron and copper. These innovations embody the principles of green chemistry by minimizing hazardous waste, reducing dependence on toxic solvents, and enhancing overall reaction efficiency. In the context of herbal chemistry, benzimidazole derivatives exhibit a strong synergy with phytochemicals and natural extracts, enhancing their pharmacological attributes—particularly antioxidant, antimicrobial, anti-inflammatory, and anticancer properties. Biogenic synthetic approaches inspired by natural enzyme pathways highlight the potential for integrating biological catalysis with green synthesis. Furthermore, the eco-designed modifications of Benzimidazole compounds represent an important step toward developing non-toxic, sustainable pharmaceuticals with minimal ecological impact. Their adaptability across diverse biological systems and low environmental footprint make these molecules vital in bridging sustainable organic synthesis and modern medicinal chemistry. Overall, Benzimidazole derivatives stand as a promising example of how chemical innovation can align with the goals of environmental preservation and green technological advancement.

Keywords: Benzimidazole; Green chemistry; Herbal synthesis; Eco-friendly catalysis; Sustainable drug design; Phytochemical integration; Biogenic pathway; Antioxidant activity; Environmental sustainability; Heterocyclic compounds.

ADVANCED AI FRAMEWORK USING I-CNN FOR PREDICTIVE MODELING OF CARDIOVASCULAR DISEASE RISK FACTORS

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Abstract

Cardiovascular disease (CVD) remains a major global health challenge and is a leading cause of mortality worldwide. The exponential growth of clinical and medical data necessitates the development of accurate and efficient predictive models to support early diagnosis and timely medical intervention. This study presents a hybrid artificial intelligence (AI) framework which leverages advanced deep learning and optimization techniques for enhanced cardiovascular disease prediction. Comprehensive preprocessing of structured clinical data—including normalization, feature scaling, and data augmentation—is performed to address missing values, outliers, and inconsistencies. Feature extraction is conducted using an Improved Convolutional Neural Network (I-CNN) ensuring robust representation of vital cardiovascular indicators. To optimize the selection of relevant risk factors, the Red Piranha Optimization algorithm is employed. The proposed classification model integrates I-CNN with a hybrid AI-based predictive system, facilitating real-time and accurate detection of cardiovascular disease. This framework demonstrates the capability of hybrid models to improve CVD prediction, informing early intervention strategies and personalized clinical decision-making for diverse patient populations.

Keywords: Artificial Intelligence, Big data, Biomedical, Machine learning, Algorithm, Electronic Health Record, Medical Health Record, I-CNN, I-PCA.

ETHNOBOTANICAL AND PHYTOCHEMICAL STUDY OF *ECLIPTA PROSTRATA*

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Abstract

Eclipta prostrata (commonly known as Bhringraj or False daisy) is a widely distributed medicinal herb belonging to the Asteraceae family, and is commonly used in traditional medicine across Asia and South America. In Ayurvedic traditions especially, this herb has been used to treat a wide range of health issues from bleeding disorders (like nosebleeds, haematuria, and uterine bleeding) to liver and kidney malfunctions. It is also used for skin diseases, respiratory ailments, heart conditions, hair loss, vitiligo, snakebite remedies, and digestive troubles. Phytochemical studies investigations have revealed that *E. prostrata* contains a diverse array of bioactive compounds including coumestans (notably wedelolactone), triterpenes, saponins, steroids, flavonoids, thiophenes, polypeptides, and phenolic acids. These constituents have a role in the broad spectrum of pharmacological effects like hepatoprotective, antioxidant, antimicrobial, anti-inflammatory, cytotoxic (against tumor cells), hypo-glycemic, hypolipidemic, neuroprotective, and even hair-growth promoting

properties. Even though *E prostrata* has a long history of traditional use and shows a lot of potential in modern studies, there's still a gap in our understanding. That is why future research needs to dig deeper, pinpointing those active molecules and seeing how they work using controlled clinical trials. In summary, *Eclipta prostrata* is a botanical treasure with deep roots in folk medicine and a fascinating phytochemical legacy. Though much has been learned, there is still a frontier of discovery ahead to bridge the gap between ancient wisdom and modern pharmacology. This review highlights its botanical description, medicinal uses, bioactive compounds, and pharmacological activities of *E. prostrata*.

Keywords: - *Eclipta prostrata*, Traditional medicine, phytochemistry, Coumestans, hepatoprotective activity.

FUNCTIONAL CHARACTERIZATION OF EUGENOL TARGETS IN BUDDING YEAST, *SACCHAROMYCES CEREVISIAE*

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Abstract

Eugenol, a naturally occurring phenylpropanoid, is present in a variety of plants, including bay leaves, cloves, and cinnamon. It has antimicrobial, analgesic and antioxidant properties and therefore, used in the treatment of various ailments such as cardiovascular and liver diseases. Despite multiple applications of eugenol, its molecular and genetic targets are poorly described. Hence, we used budding yeast *Saccharomyces cerevisiae* as model system to study the intracellular targets of eugenol. Screening of the histone H3 point mutation library (50 mutants) revealed various sensitive and resistant strains against eugenol which was further mapped to nucleosome to demonstrate the interaction of eugenol onto nucleosomes. We found four resistant mutants- H3G13A and H3K14A, which are present in the tail region, H3V35A and H3K37A which are present at the DNA entry and exit point of the nucleosome. Similarly, several sensitive mutants were also identified among which H3K42A was highly sensitive for eugenol exposure. Furthermore, eugenol drug-protein interactome was generated using STICH tool, which contains transcription factors- Mbp1 and Swi6, transcription activator- Swi4, cell cycle regulator- Pho81 along with few molecular chaperones indicating that eugenol exposure will affect widespread transcriptomics changes. Overall, this study will help in understanding the mode of action of eugenol and can be used in drug development.

Keywords: Eugenol; Histone proteins; Nucleosome; bioinformatics; Drug-protein interactome.

HIGH-SENSITIVITY TAPERED OPTICAL FIBER SPR BIOSENSOR

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Abstract

Tapered optical fiber surface plasmon resonance (SPR) biosensors have attracted attention due to their compactness, high sensitivity, and suitability for label-free biological detection. In optical fiber SPR biosensor,

the small part of optical fiber coated with a thin metal (typically gold or silver) is placed in the sensing medium. The strong interaction leads to a measurable resonance wavelength shift corresponding to changes in the refractive index of the surrounding medium. The propagation constant of the guided mode in the tapered region is theoretically analysed as a function of taper geometry, wavelength, and surrounding refractive index. By using the ray model approach propagation constant of light in tapered optical fiber and surface plasmon wave is calculated at different taper ratio for each tapered profile. In this present work, due the change in this plasmonic condition we calculate the sensitivity of the tapered optical fiber having different tapered profiles and it is found that tapered profiles of the optical fiber enhance the sensitivity of the SPR biosensor. The structure of sensor allows real-time monitoring of binding events without the need for fluorescent or radioactive labelling. Owing to its simple design, low cost, and high performance, the proposed tapered fiber surface plasmon biosensor offers great potential for applications in medical diagnostics, environmental monitoring, and biochemical analysis.

Keywords: Surface Plasmon Resonance, Ray model approach, Sensitivity, Label free detection.

HEAVY METAL REMEDIATION FROM PHOTOAUTOTROPHIC MICROORGANISMS, CYANOBACTERIA BY USING MICROBIAL CONSORTIUM

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Abstract

Environmental contaminants present substantial risks to human health, agriculture, climate, and economic stability. Over the past two decades, rapid industrial growth has negatively impacted the environment through the release of toxic effluents and untreated waste products. These pollutants not only harm the environment but also affect human health, leading to severe chronic diseases. While various traditional physical and chemical approaches have been used to address environmental contamination, their high costs and the generation of toxic residual products pose significant challenges. Consequently, microbial-based bioremediation has been increasingly employed in recent years as a strategy to mitigate these challenges. The utilization of cyanobacteria species is an emerging microbial approach for contamination management. Cyanobacteria, a group of photoautotrophic microorganisms commonly found in diverse habitats, are readily available resources for application in contamination management. This research paper discusses the recent advancements in cyanobacterial-based bioremediation of environmental contaminants. In brief, this technology provides a clean and green solution by reducing the levels of toxic heavy metals in the polluted environment, restoring the health of the ecosystem, and avoiding the negative impacts associated with traditional pollution control methods. The advantage of the consortium mixture of different microorganisms (the consortium) is often more robust and efficient than a single species alone. They show better adaptation to various types of metals and environmental conditions. Furthermore, *in silico* studies have been conducted to examine the nature of pollutants and their management by cyanobacterial species.

Keywords: Cyano-remediation, Bioremediation, Environmental Contaminants, Biosorption, Bioaccumulation.

ETHNOMEDICINAL AND PHYTOCHEMICAL EVALUATION OF *DATURA STRAMONIUM* IN RESPECT TO MOLECULAR APPROACHES AND ENVIRONMENTAL MANAGEMENT

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Abstract

Datura flowers are widely offered in the worship of Lord Shiva across India and in other countries. This sacred plant is believed to possess medicinal properties and responsible for environmental management. *Datura stramonium* (Dhatoora), despite its known toxicity, holds significant ethnomedicinal importance due to its diverse secondary metabolites, including alkaloids, flavonoids, tannins, terpenoids, saponins, phenols, steroids, and glycosides. Traditionally used for analgesic, sedative, and antimicrobial purposes, it continues to attract scientific interest for its pharmacological potential as well as sustainable healthy environment. This study evaluated the phytochemical profile and bioactivity of *D. stramonium* leaf and fruit extracts using aqueous and hexane solvents prepared through Soxhlet extraction. Qualitative and quantitative assays confirmed the presence of multiple bioactive compounds. Hexane extracts exhibited higher levels of alkaloids, flavonoids, and phenolics, whereas aqueous extracts were richer in tannins. Antioxidant activity, assessed via Ascorbate Peroxidase (APX), along with preliminary antimicrobial screening against bacterial and fungal strains. Further demonstrated the plant's therapeutic potential. The findings suggest that, despite its toxicity, controlled extraction and proper dosing of *D. stramonium* could harness its medicinal properties. This study emphasizes the importance of scientifically evaluating toxic flora for drug discovery, particularly in addressing antimicrobial resistance and oxidative stress-related disorders. Overall, *D. stramonium* shows promising applications in antioxidant, antimicrobial, and traditional medicine contexts, reinforcing its relevance in both ethnomedicine and modern pharmacology with maintaining the environmental sustainability.

Keywords: *Datura stramonium*, Phytochemical profiling, Secondary metabolites, Antioxidant activity, Antimicrobial activity, Therapeutic potential.

ANTIBACTERIAL ACTIVITY OF ETHNOLIC ROOT EXTRACTS OF *GLYCYRRHIZA GLABRA* AND *WITHANIA SOMNIFERA* AGAINST *ENTEROCOCCUS FEACALIS* AND *ESCHERICHIA COLI*

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Abstract

Escherichia coli and *Enterococcus faecalis* are most common human healthcare pathogen and are capable of causing a variety of infections including endocarditis, sepsis, surgical wound infections, and urinary tract infections. Enterococci are found in the soil, water, food, sewage, plants, human skin, the oral cavity, and the large intestine, constituting less than 1% of the total microbiota. They mostly cause skin infections and

gastrointestinal problems. . It is also the causative agent of neonatal meningitis, acute enteritis in humans as well as animals and is a general cause of „traveller's diarrhoea. More than 90 present of enterococci infections are caused by species: *E. faecalis* .The accumulation of drug resistance elements and virulence factors are increasing. So there is also increase in the demands of natural compounds for alternative action against the infections. *Glycyrrhiza glabra* and *withania somnifera* are common and traditionally, they are widely used for various medical purpose as anticancer, anti-ulcer, anti-diabetic, anti-inflammatory, antioxidant, antimalarial, antifungal, anti-bacterial, estrogenic, anti-allergenic and expectorant and anticonvulsant. These plants have effective phytochemicals which are combat against these organisms. The present study was carried out to characterize the bioactive constituents present in plant extract (ethanol extracts) of *Glycyrrhiza glabra* and *Withania somnifera* using gravimetric traditional biochemical methods.to charecterized the presence of phytochemical constituents. Antibacterial effect of glycyrihza glabra and withania sonifera ethenolic roots extracts were evaluated on strains of *E. coli* and enterococcus faecalis by well diffusion assay. Phytochemicals from *G. glabra* and *w. somnifera* are very effective to inhibit both organisms. Phytochemical analysis showed the presence of steroids, saponins, tannins, Flavonoids, and phenols which constitute the active ingredients of the extracts and play role in the inhibition of the bacteria. Ethenol root extract of *w.somnifera* was found to be most effective than the ehtenolic root extracts of *G.glabra*.

Key words: *E.coli*, *E.feacalis*, antibiotic resistance, phytochemicals, *glycyrrhiza glabra* and *withania somnifera*.

A TOXIC- FREE FUTURE: REVIEWING THE CHALLENGES AND POTENTIAL OF PLANT DERIVED FOOD COLORANTS

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Abstract

Despite the low cost and stability of Synthetic Food Colorants (SFCs), their usage is facing escalating challenge by intensifying toxicological evidences. Modern and educated consumers always prioritize their health. Evidences of linking approved SFCs to adverse health issues in children and adults is fueling a significant consumers push for 'clean label' ingredients. This necessitates a shift toward safer, natural plant-derived pigments (PDPs) as natural food colors in the food industry. This comprehensive review encompasses an analysis of national and global colorant use, assesses SFCs toxicology and outlines transition challenges and commercial opportunities. "FSSAI" a pivotal regulatory body sets a 100ppm limit for approved synthetic food colors like Tartrazine (yellow), Sunset yellow (yellow), Allura Red (Red) etc ; but some, like Red Dye No. 3, are linked to health risks like cancer. Notably, some FSSAI-approved colors are banned or restricted in the EU and USA. This regulatory gap demands that the FSSAI re-evaluate its guidelines to ensure consumer safety. A safer alternative is needed, and natural pigments including anthocyanins, carotenoids, and betalains etc. can offer a non-toxic solution. However, these natural colorants have stability issues that can be overcome through microencapsulation, which enhances their shelf life. The replacement of SFCs with PDPs is essential for food safety and meeting public expectation. Achieving successful, large-scale commercialization relies on both sustained research into stabilization technologies and a harmonized, proactive global regulatory framework that supports the viability, mass production, and market adoption of safe, effective, and sustainable plant-based food colorants.

Keywords: SFCs, PDPs, Toxicology, food colors, FSSAI.

ASSESSMENT OF SUSTAINABLE FOOD PURCHASING BEHAVIOR AT THE URBAN HOUSEHOLD LEVEL

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Abstract

Sustainable consumption has become a key concern in urban households, as their high consumption generates food waste that increases landfill use, greenhouse gas emissions, and resource depletion. The paper aims to understand the purchasing behaviour of urban households in context of food purchasing and to know about awareness of families regarding sustainable purchasing. Primary data was collected from 110 households across different areas of Patna through online Google Forms using convenience sampling. The findings indicated that majority of respondents prioritized freshness (41.4% agreed, 49.5% strongly agreed), local sourcing (50.54% agreed, 35.1% strongly agreed), and environmental considerations such as verifying eco labels or organic certifications (45% agreed, 11.7% strongly agreed). Only 44.1% agreed and 9.9% strongly agreed that they deliberately selected food products that reduce carbon emissions. A smaller number of individuals, opted for ready-to-eat meals, showing inclination towards environmentally beneficial choices. The results also showed that the majority of respondents perceived issues with container design, insufficient knowledge, and a lack of sustainable options as barriers to purchasing sustainable food. Significant number of participants demonstrated a strong awareness of the connection between dietary selections and climate change. Many acknowledged the impact of governmental initiatives on their behaviours, although the understanding of technical concepts like emission reduction and conscious purchasing efforts remained lower. In conclusion, the results showed that more people are becoming aware and committed to buying food in a way that is beneficial for the environment.

Keywords: Sustainability, Purchasing behaviour, Urban household.

SMART AGRICULTURE FOR THE BRASSICACEAE FAMILY: INTEGRATING MOLECULAR INSIGHTS WITH FIELD INNOVATIONS

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Abstract

Recent advancements in *Brassica* research have significantly enhanced our understanding of genetic diversity, stress adaptation, and crop improvement strategies across oilseed and vegetable species. Development of *Brassica nigra* monosomic alien addition lines has elucidated chromosomal behavior, gene introgression, and intergenomic interactions critical for trait transfer and polyploid evolution. The application of CRISPR/Cas9 genome editing has revolutionized *Brassica* breeding by enabling precise manipulation of genes governing yield, quality, and stress resilience. Disease resistance studies have identified durable sources of immunity to *Albugo candida* across diverse *Brassica* accessions and related genera, offering valuable donor materials for

resistance breeding. Genome wide analyses of transcription factors such as R2R3-MYB and detoxifying enzymes like glutathione S-transferases have revealed key regulators of abiotic stress responses, secondary metabolism, and redox balance. Comparative transcriptomic and physiological evaluations under drought stress have provided insights into differential gene expression, antioxidant defense, and hormonal regulation in *B. juncea* and *B. napus*. Meanwhile, long-term statistical assessments of mustard (*B. nigra*) cultivation in northern India highlight steady growth trends influenced by improved agronomic practices and policy support. Collectively, these integrative findings strengthen the molecular and physiological foundation for enhancing *Brassica* productivity, resilience, and genetic resource utilization, supporting sustainable agriculture and future breeding innovations.

Keywords: *Brassica* species, genome analysis, CRISPR/Cas9, abiotic stress, gene expression, cytogenetics, disease resistance, crop improvement, sustainability.

HOLES PARAMETERS BY LOW ENERGY AR⁺ ION ON SI-RIPPLES

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Abstract

In this paper we have calculated the values of various holes parameters that are associated with the ripple formation on the Si-substrate. Ar⁺ ion beam of energy in the order of ~10keV were used to create nanopatterning. Ion induced Silicon-substrate ripples volume create surface morphological restructuring. The scaling behavior of induced ripples is investigated to analyze holes, hills and corresponding volume in their proximity by the effect of ion fluence of order ~10¹⁷ Ar⁺/cm² at an incidence angle of 35° < θ < 75° with respect to surface normal. A normalized ripple behavior and surface parameters is observed at an angle in the range of 40° < θ < 60° respectively. Results were generated using the AFM micrographs. Gas sensors made of these modified patterned surfaces can be used in advanced industry 4.0 with the integration of various 2D-materials layers on these surfaces through applicable techniques like chemical vapor deposition ultimately creating enhanced solid surface for molecular sensitivity in environment monitoring.

Keywords: nanopatterning, Si-substrate, AFM Micrographs, Gas sensors.

PLANT RESPONSES TO ABIOTIC AND BIOTIC STRESSES

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Abstract

Plants have developed numerous strategies to deal with diverse abiotic and biotic stresses that endanger their lives growth and reproduction. Abiotic stresses like drought, salinity, temperature, heavy metals toxicity disturb physiological processes like photosynthesis, nutrition acquisition and water relations. Plants tolerate

stress by various ways such as production of protective hormones, protective substances, stress prohibiting genes, secondary metabolites and showing physiological, biochemical and molecular reactions against biotic and abiotic stresses. Plants respond against these stresses by producing various compounds that help in maintaining turgidity of cell under drought, production of compounds such as proline that helps in tolerating stress of higher salinity. Plants inhibit water losses by closing stomata. ABA is also a useful tool for plants to fight against stress as it regulates metabolism during water stress and is also helpful in regulating stomatal behaviour. They protect their photosynthetic mechanism by wilting of leaves and protect themselves from radiations such as UV rays by curling their leaves. They also protect themselves against radiations by accumulating secondary metabolites such as specific alkaloids. They regulate biotic stresses such as bacteria, fungi, insects, herbivores by various modifications and by producing a protective waxy coating. They secrete various antifungal, antibacterial and antimicrobia substances.

This paper employs a review based methodology and seeks to analyze and explain the response mechanism of plants to biotic and abiotic stresses prevalent in the environment.

Keywords: ABA, Proline, Alkaloids, Secondary metabolites, Wilting.

MILLET MILK: PRODUCTION, COMPOSITION, PROCESSING, FUNCTIONALITY AND COMMERCIALIZATION POTENTIAL - A SYSTEMATIC REVIEW

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Abstract

A promising class of plant-based milk substitutes with clear nutritional and sustainable benefits are millet-based milks (from finger millet or ragi, pearl millet or bajra, foxtail, kodo, proso, and other small millets). This review's primary goal is to provide a quick overview of millet milk's production process, as well as to examine its nutritional content and its advantages over other plant-based milks. Pre-treatments such as germination/malting, roasting, enzymatic hydrolysis, and fermentation increase extract yield, decrease antinutrients (phytates or tannins), and improve mineral bio-accessibility and sensory quality, according to the literature, which also demonstrates repeatable aqueous extraction methods (soak-mill-filter). Lactic culture fermentation can result in probiotic millet drinks that are more palatable, have a longer shelf life, and contain more B vitamins. Characteristics such as colloidal instability (sedimentation), gritty texture, and cereal-like off-flavours are still major technological challenges that can be addressed by homogenization, stabilizers or emulsifiers, enzymatic modification, and mixing with other plant milks. Standardized processing procedures such as industrial scale data, long-term shelf-life experiments, and human clinical research on nutritional bioavailability and glycemic response are among the gaps in the evidence, which is mostly experimental and small-scale. All things considered, millet milks are an underutilized, nutrient-dense, and climate-resilient Plant Based Milk Alternative option that deserves concerted research and industry translation.

EFFECT OF CLIMATE CHANGE ON PHYTOPLANKTON: CHALLENGES AND THE GLOBAL RESPONSE

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Abstract

Phytoplankton are tiny ocean plants that form the foundation of the marine food web. They create about half of the world's oxygen and help absorb carbon dioxide, which is important in fighting climate change. However, warmer water, more acidic oceans, and changes in nutrients are making phytoplankton less common in some areas. This can harm fish, whales, and food supplies. For example, recent studies show that phytoplankton production has dropped by 40% in parts of the Mediterranean. Climate change brings many challenges for phytoplankton, including higher water temperatures, changes in rainfall, melting ice, and more acidic seas. These factors affect how phytoplankton grow, where they live, and when they appear. Some types may grow faster, while others may disappear, which can upset the balance of ocean life. Still, governments are taking action to protect the oceans. The United Nations' Goal 14 focuses on saving marine life, and in the U.S., climate action plans address ocean warming and acidification. This study explains these changes in simple terms, looks at future risks, and explores how they affect ecosystems and people. It also covers current government programs and international agreements like the Paris Agreement, as well as actions by the United Nations and IPCC to cut greenhouse gas emissions, support research, and protect aquatic habitats. These efforts can help keep ecosystems healthy and make sure phytoplankton continue to support life on Earth.

Keywords: Phytoplankton, Climate Change, Ocean Acidification, Marine Ecosystem, Oxygen Production, Global Warming, Biodiversity, Paris Agreement.

ETHNOBOTANICAL AND PHYTOCHEMICAL STUDY OF *GYMNEMA SYLVESTRE* USED FOR TREATING DIABETES

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Abstract

Diabetes mellitus is a metabolic disorder that poses a significant threat to human health. *Gymnema Sylvestre*, also known as Gurmar or "sugar destroyer," is a medicinal plant of great importance, widely used in Ayurvedic and folk medicine for the management of diabetes. Traditional medicine, particularly ethnobotanical knowledge, offers a valuable source of potential antidiabetic agents. This study presents an ethnobotanical and phytochemical investigation of *Gymnema Sylvestre*, a medicinal plant from the Apocynaceae family, widely recognised in traditional medicine for its antidiabetic properties. The study documents the methods of preparation, modes of administration, and dosage forms in treating diabetes using *G. Sylvestre*. Phytochemical analysis reveals that *G. Sylvestre* contains key bioactive compounds. The Gymnemic acids have been shown to suppress the sweet taste sensation and improve glucose metabolism. The findings emphasise the importance

of preserving indigenous knowledge and conducting further pharmacological studies to validate the efficacy and safety of *G. Sylvestre* as a natural antidiabetic agent. This study supports the potential integration of ethnobotanical resources into modern therapeutic practices for diabetes management.

Keywords: *Gymnema sylvestre*, Apocynaceae, ethnobotany, medicinal plants, traditional medicine, antidiabetic activity.

SECURE MULTIMODAL FUSION OF GENOMIC AND DEMOSCOPIIC DATA FOR SKIN CANCER PREDICTION

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Abstract

Integrating genomic and dermoscopic data can significantly improve the accuracy of skin cancer diagnosis, but data sharing across institutions raises critical privacy concerns. This paper presents a secure multimodal fusion framework that enables joint learning from genomic and dermoscopic data while preserving patient confidentiality. The proposed model employs a Vision Transformer for dermoscopic image encoding and a Transformer-based genomic encoder, whose embeddings are fused using a cross-attention mechanism to capture inter-modality relationships. To ensure data privacy, federated learning with differential privacy and secure aggregation is implemented, allowing decentralized model training without exposing raw data. Experimental results on public skin lesion and genomic datasets demonstrate that the proposed approach achieves higher diagnostic performance than single-modality models, while maintaining strong protection against re-identification and inference attacks. This framework offers a practical, regulation-compliant solution for privacy-preserving, multimodal skin cancer prediction.

Keywords: Privacy-Preserving Machine Learning, Federated Learning, Differential Privacy, Homomorphic Encryption, Multimodal Data Fusion, Genomic Data Security, Dermoscopic Image Analysis, Skin Cancer Prediction, Secure Healthcare AI.

FROM ROOTS TO RESILIENCE: THE ROLE OF ETHNOBOTANY IN BUILDING A SUSTAINABLE VIKSIT BHARAT

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Abstract

Ethnobotany provides immense impetus to understand the natural resources and link them with modern efforts. The need for new medicines, drug discovery, herbal medicines, and solutions to the problems of food security, unemployment, sustainable livelihoods, scientific research, and innovations led us to document and preserve the indigenous wisdom on plant uses. The study aimed to investigate the role of ethnobotany in the day-to-day lives of common people. Surveys were undertaken, people were interviewed through questionnaires, and information was collected. Results showed that ethnobotany offers various practical uses

that are essential in building a sustainable Viksit Bharat. These uses include plants as medicines (toothache, diabetes, anti-cancer drugs, antimalarial drugs, and so on), food sources, healthcare practices, and handmade products (e.g., trumpets, flutes, bamboo baskets, etc.). To solve the problems of unemployment, agriculture, horticulture, floriculture, and organic farming can be promoted. It can also contribute to biodiversity conservation, sustainable development, and economic growth. Thus, the finding suggests that ethnobotany provides valuable insights for researchers, policymakers, economists, and different national and international organizations like WHO, FAO, UN-SDGs, etc., to bridge the gap between traditional wisdom and modern development, building a sustainable pathway to achieve Viksit Bharat.

Keywords: Ethnobotany, Sustainable Development, Indigenous Knowledge, Biodiversity Conservation, Herbal Medicine, Livelihood Generation, Viksit Bharat.

IMPACT OF CLIMATE CHANGE ON BIODIVERSITY AND AGRICULTURE

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Abstract

Climate change has emerged as a significant global issue in recent years, presenting one of the most pressing environmental challenges that impacts all natural ecosystems worldwide. Key factors associated with climate change include rising CO₂ levels, accelerated glacier melting, variability in rainfall, and severe droughts. These factors influence biodiversity in various ways, such as shifts in species distributions, changes in relative abundance within species ranges, and more subtle alterations in activity timing and microhabitat usage. Additionally, soil properties and water resources are negatively affected by the rapidly changing climate. Addressing these consequences requires integrated management approaches, effective planning, and the development of policies to protect biodiversity and the environment. This review discusses the impact of climate change on prokaryotic and eukaryotic communities, the environment, and economic aspects, as well as community responses to these changes and the conservation strategies that could be implemented.

Climate change is increasingly recognised as a serious and widespread threat to biodiversity. The environmental changes resulting from climate change may occur too quickly for many species to adapt, potentially leading to extensive extinctions. It may also trigger migrations, thereby affecting biological diversity on both regional and global scales. Species such as whales, ringed seals, and polar bears will experience increased stress due to changes in critical interactions with sea ice. Additionally, crops are expected to fail more frequently, particularly in lower latitude regions where food supplies are already limited. The increased occurrence of droughts, strong winds, and winter storms will significantly impact commercial forestry, resulting in massive losses. As a result of climate change, species must adapt, move, or face the risk of extinction.

Changes in Agriculture: In India, 40% of the total cropped area is irrigated, while 60% relies on rainfed agriculture, making it vulnerable to the uncertainties of the monsoon. Over the years, more nutrients have been removed from the soil than have been added through fertilisers. Consequently, farmers now need to apply more fertilisers to achieve the same yields they obtained with lower fertiliser use 20 to 30 years ago. There has also been a decline in the yield of the rice-wheat cropping system, with adverse effects anticipated to be greater for rabi crops than for kharif crops by 2050.

Keywords: Climate change, Biodiversity, Extinctions, Agriculture, Soil nutrients.

MANAGEMENT OF HYPERTENSION DISEASE THROUGH THE KNOWLEDGE OF HERBAL PLANT CHEMISTRY OF HAJIPUR BLOCK OF BIHAR

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Abstract

Hypertension is a major life style related disorder which poses a significant role in public health, challenging both urban and rural region of India. In recent years, the exploration of ethno medicinal practices of traditional herbal remedies have gained renewed attention of todays medical treatment. Now a days we discovered new drugs which became resistant to different persons due to resistivity of the body according to the patient healths. We can now check resisitivity of drugs through bioinformatics, by the process of “docking of drugs”. In the docking of drugs, we examine that which antibiotics are resistance to any person. Through bioinformatics, one can check any biological inquiry of proteins, genes, genetic diseases through the genomic study of genes. Genes are also made of proteins. Ethnomedical practices involve particularly utilizing various ailments through traditional herbal medicine. My survey focuses on the documenting and analizing the ethnomedical knowledge and phytochemical analysis of herbal plants, traditionally used here to manage hypertension. I have surveyed interviews with local healers and sample collecting of the area of Hajipur block of Bihar District.

Through my survey these medicinal species were identified, which are *Ocimum sativum* (Tulsi) *Moringa oleifera* (Drum Stick tree) *Terminalia arjuna* (Arjun), *Allium Sativum* (Garlic), *Rauvolfia serpentina* (Sarpagandha) etc. Phytochemical screening of these revealed the presence of bioactive compounds such as alkaloids, flavonoids, tannins, saponins, and phenolic compounds, which have antioxidant, Vasodilatory, lipid lowering effects and diuretic properties, These finding highlights the strong relation between ethnomedical knowledge and pharmacological potential of these plants for hypertension management. This study also undercovers the importance of conserving medicinal plants for future, because some medicinal plants are endangered due to deforestation, erosion & industrialization. We can also integrate these study with modern pharmacological research to develop safer plant based antihypertensive formulations.

Keywords: Hypertension, Herbal medicine, Phytochemistry, Ethnomedicine, Genomics, Bioinformatics, Diuretic, Antioxidant, Vasodilatory, Resistant, Docking, Traditional, Hajipur, Bihar.

FROM WASTE TO WELLNESS: MUSHROOM FARMING AS A MODEL OF SMART AND SUSTAINABLE AGRICULTURE

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Abstract

Mushroom farming exemplifies an environmentally sustainable and economically viable model of smart agriculture. It offers effective solutions to food security, waste management, and environmental challenges. In the present study mushroom cultivation is described as an integrated biotechnological system that converts agro-industrial residues such as paddy straw, wheat straw, sugarcane bagasse, saw dust, animal and bird manures- into nutrient rich medicinally valuable food. This bioconversion process also reduces waste and improves carbon recycling and soil enrichment through the reuse of spent mushroom substrate.

From a nutritional perspective, mushrooms constitute a valuable source of high-quality proteins, vitamins (particularly B-complex and D), minerals, and functional biomolecules such as beta-glucans and ergothioneine. Their antioxidant, antimicrobial, and immunomodulatory properties underscore the prophylactic and therapeutic significance of mushrooms in improving public health and reducing malnutrition.

Moreover, the study underscores the role of mushroom farming in enhancing rural livelihoods, gender inclusion, and economic resilience particularly among small-scale farmers. The proper utilization of digital monitoring tools and controlled environmental systems can boost efficiency and transparency in mushroom production. It represents a circular bioeconomy model that unites agriculture, environment, and nutrition towards a sustainable and Viksit Bharat.

Keywords: Mushroom cultivation, Smart agriculture, Bioeconomy, Nutritional security, Sustainability, Viksit Bharat.

MATHEMATICAL MODELLING OF BLOOD FLOW IN NARROW ARTERY USING POISEUILLE LAW

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Abstract

The study of fluid dynamics of blood flow in the human body through narrow arteries is crucial for understanding cardiovascular disorder such as atherosclerosis (narrowing of arteries due to fatty plaque) and thrombosis (formation of blood clot inside a blood vessel). In this work a mathematical model is developed to analyze blood flow behavior in a narrow arterial segment using Poiseuille law. Using Poiseuille equation the cardiovascular system equation is also used to develop a model for blood pressure. Assuming blood behaves as a Newtonian incompressible and laminar fluid under steady flow and the artery is assumed to be a cylindrical tube. The model provide a simplified representation of hemodynamics behavior in narrow arteries that how a small decrease in arterial radius significantly increase pressure drop and shear stress.

Keywords: Poiseuille law; fluid dynamics; cardiovascular disorder; atherosclerosis.

COMMERCIALIZATION OF RESEARCH AND INNOVATION: BRIDGING KNOWLEDGE AND MARKET FOR SOCIETAL TRANSFORMATION

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Abstract

The commercialization of research and innovation represents a transformative trajectory in the contemporary knowledge economy, shifting research paradigms from academic silos to actionable, market-driven solutions. This paper critically examines the dynamics, mechanisms, challenges, and societal implications of research commercialization. Drawing from interdisciplinary perspectives—including political economy, science and technology studies, and public policy—the study explores how universities, industries, and governments

interact within national and global innovation ecosystems. The paper addresses the instrumental role of intellectual property rights, technology transfer offices, start-ups, public-private partnerships, and policy frameworks that incentivize innovation diffusion. Further, it probes ethical concerns, knowledge commodification, academic freedom, and the paradox of innovation exclusion in the Global South. Through comparative case studies (e.g., the Bayh-Dole Act in the U.S., Atal Innovation Mission in India, and Germany's Fraunhofer Institutes), the paper identifies best practices and pitfalls in the commercialization process. Using qualitative and quantitative data, including content analysis of relevant policy and academic documents, the paper proposes an integrated model of inclusive and sustainable commercialization. It argues that to truly democratize innovation, commercialization strategies must transcend profit motives and embed social accountability, environmental consciousness, and equitable access. By offering policy recommendations and a novel framework for 'Civic-Tech Commercialization,' the study positions commercialization not merely as an economic imperative but as a vehicle for societal transformation. This research aspires to provide both a theoretical foundation and a practical roadmap for stakeholders navigating the complex terrain between knowledge creation and real-world impact.

SIDEROPHORE PRODUCTION BY PLANT GROWTH PROMOTING RHIZOBACTERIA NAMELY *BACILLUS* SP.

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Abstract

Iron is an essential element for microorganisms involved in a variety of biochemical reactions, including respiration, photosynthetic transport, nitrate reduction, chlorophyll synthesis, nitrogen fixation, and detoxification of oxygen radicals. Under iron-limited conditions, most rhizo-spheric bacteria secrete siderophores, an iron chelating ligand. Siderophore is a compound with small molecular masses capable to bind with ferric ions with high affinity. Organisms which are capable of siderophore production have molecular systems which transport iron by siderophore-iron complexes into cells through iron regulated outer membrane proteins. All the four rhizo-spheric strains demonstrated diverse levels of siderophore production activity under *in vitro* conditions in presence of various carbon and nitrogen sources. Biochemical characterizations were carried out. Qualitative detection of siderophore production were carried out in Chrome Azurol S (CAS) added agar plate in basal medium, JNFb⁻ medium and M-9 medium. Quantitative estimation of siderophore production was carried out in JNFb⁻ medium and M-9 medium. Formation of Colony diameter and halo zone diameter were measured in above three solid agar plate media after 24h, 48h, 72h and 96h of growth. Catecholates types of siderophore were detected. Siderophore tests were also made in presence of different concentration of Fe EDTA. Among the four strain *Bacillus Sp.* MR-SP was the most efficient strains in terms of its capability to produce siderophore. The increase of Fe(III) concentration, had a negative effect in siderophores production, specially above 10 µM. Altogether, strain MR-SP could be applied as bio-inoculum in different formulation in seeds or crop fields under iron limited conditions.

Key words: Siderophore, PGPR, *Bacillus sp.* Rhizobacteria, Catecholate. Ferric ion.

ECOLOGICAL DISCOURSE IN 21ST CENTURY'S HINDI LITERATURE: AN INTERDISCIPLINARY DIALOGUE FOR RESILIENCE AND SUSTAINABILITY

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Abstract

The 21st century, marked by the palpable realities of the Anthropocene, has witnessed a significant and urgent shift in the ecological discourse within Hindi literature. Moving beyond romanticized depictions of nature or symbolic protests, contemporary literature has begun to engage directly with the complex, interconnected crises of climate change, resource extraction, species extinction, and environmental injustice. This paper argues that 21st-century Hindi literature serves as a critical cultural forum, fostering an essential interdisciplinary dialogue that bridges the gap between scientific data and human experience to model pathways for resilience and sustainability.

Through an analysis of a diverse corpus—including novels of environmental realism, dystopian narratives, and non-fictional eco-writing—this study examines how authors and poets like Nasira Sharma, Mahua Maji, Sanjiv, Anant Kumar Singh, Akhilesh, Jaynandan, Naresh Saxena, Kumar Ambuj, Rajni Tilak etc. respectively have reframed the ecological debate. Their works do not merely depict environmental degradation but critically interrogate its root causes: neoliberal development, urban-rural divides, gendered impacts of ecological loss, and the erosion of indigenous knowledge systems. Through a close reading of select novels, short stories, and poetry, this research demonstrates how literature articulates the lived experiences of ecological degradation, giving a human face to abstract environmental data.

Ultimately, this paper proposes that Hindi literature serves as a vital, often overlooked, repository of knowledge for building socio-ecological resilience. It facilitates a necessary dialogue between the humanities, social sciences, and environmental sciences by translating scientific urgency into cultural and emotional intelligibility.

Key words: Ecology, Discourse, Interdisciplinary, Dialogue, Resilience, Sustainability.

EVALUATION OF ACUTE ORAL TOXICITY OF ETHANOLIC EXTRACTS FROM SEEDS AND FRUIT PULP OF *SYZYGIVM CUMINI* L. IN SWISS ALBINO MICE.

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Abstract

Syzygium cumini Linn., commonly referred to as Jamun, is a remarkable fruit belonging to the Myrtaceae family, primarily cultivated in various regions of India. This tropical tree is celebrated for its deliciously sweet and slightly astringent berries, which are not only enjoyed fresh but also transformed into beverages and jams. The fruit of *Syzygium cumini* is not only a culinary delight but also a nutritional powerhouse. It is utilised to

enhance the dietary value of numerous food items, thanks to its rich content of phytoconstituents such as gallic acid, tannins, and polyphenols. These compounds contribute significantly to its pharmacological properties, particularly its traditional use in managing diabetes in folk medicine. Despite its health benefits, there is a notable gap in knowledge regarding the potential toxicity of Jamun. To address this, a study was conducted using Swiss albino mice, where various acute oral doses of ethanolic extracts from the seeds and fruit pulp of *Syzygium cumini* were administered across a wide range (100 to 5000 mg/kg). After 14 days of careful observation, we evaluated biochemical and haematological parameters. The results of this study revealed no significant differences between the treatment groups and the control group, indicating that even at high concentrations, the extracts from *Syzygium cumini* are safe for prolonged use. This finding paves the way for further exploration of this fruit's health-promoting properties without the concern of toxicity.

Keywords: *Syzygium cumini*, Jamun, acute toxicity, LD50, biochemical parameters.

MIMO ANTENNA FOR WIRELESS COMMUNICATION

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Abstract

In the modern era of AI, antenna plays an important role in transmitting large amount of data from one location to another. MIMO antennas transmit and receive multiple data streams simultaneously over the same frequency channel. Each stream takes a unique spatial path, leveraging multipath propagation (signal reflections and scattering) usually seen in real-world environments. The receiver uses these spatial differences (spatial signatures) to separate, decode, and reconstruct the original data. MIMO systems can boost connection speed by more than 70% compared to single antenna (SISO) setups, especially as the number of antennas grows. Multiple antennas help offset multipath fading and improve reliability, resulting in a higher signal-to-noise ratio (SNR) and reduced error rates. MIMO technology expands the coverage area and allows more users to connect simultaneously. It plays a key role in cellular networks, Wi-Fi, and autonomous vehicles. A 2×2 MIMO (Multiple Input Multiple Output) antenna system employs two transmitting and two receiving antennas to simultaneously transmit and receive two independent data streams over the same frequency band. This configuration enhances the channel capacity and provides significant improvements in data throughput and signal reliability when compared to single antenna setups. By exploiting multipath propagation, the system minimizes the effects of fading and interference, resulting in higher spectral efficiency and more robust wireless connectivity. The compact 2×2 MIMO architecture is commonly used in modern wireless devices and infrastructure, including Wi-Fi routers and 4G/5G systems, offering up to a 100% increase in data rates over single input, single output (SISO) systems. Proper antenna arrangement and isolation are critical to achieving optimal performance, making 2×2 MIMO a practical and effective solution for high-speed wireless communication in environments with complex signal propagation.

MICROFLORA OF SOAPSTONE MINING AREA AND PLANT GROWTH-PROMOTING POTENTIAL ASSOCIATED WITH PIONEER PLANT SPECIES IN BAGESHWAR DISTRICT OF UTTARAKHAND

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Abstract

Soapstone, or steatite, is a metamorphic rock rich in talc, known for its softness, density, heat resistance, and chemical stability. It is widely used in countertops, tiles, laboratory linings, and cookware. India, especially Uttarakhand and Rajasthan, is a major producer, with extensive mining in Bageshwar and Chamoli districts—particularly in Reema Valley, Kanda, and Bhatkot, which together host around 90 mines. However, these large-scale mining operations cause habitat loss, land degradation, soil erosion, and reduced biodiversity. Microbes play a vital role in restoring such disturbed environments by improving soil health, aiding plant growth, and decomposing pollutants. This study examined microbial diversity in pioneer plant species like *Echinochloa crus-galli*, *Artemisia* sp., *Bidens pilosa*, and others growing naturally in Kanda and Bhatkot mining sites. Using serial dilution and spread plate techniques, researchers isolated 40 bacterial and 30 fungal strains, with seven bacterial and seven fungal genera identified, along with arbuscular mycorrhizal fungi from five genera. The microbial community showed strong symbiotic associations even in harsh mining conditions. Screening revealed significant plant growth-promoting traits: 32 bacterial isolates solubilized phosphate, 25 produced siderophores and ammonia, and 28 synthesized IAA, especially in *Actinobacteria*, *Streptomyces*, and *Bacillus*. Similarly, fungal isolates, particularly *Penicillium*, *Curvularia*, and *Fusarium*, exhibited these traits, highlighting their potential to enhance soil fertility and support ecological restoration in degraded soapstone mining areas.

Keywords: Mycorrhizal associations, Pioneer plant rhizosphere, Soil microflora, Soapstone mining.

UNRAVELING THE IMPACTS OF SALT STRESS ON *TARGETES ERECTA* UNDER VARYING CONCENTRATION AND COMBINATION OF SALTS.

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Abstract

Salt stress is one of the major abiotic factors limiting plant growth and productivity, particularly in ornamental horticulture. *Tagetes erecta* (African marigold), belonging to the Asteraceae family, is highly valued for its aesthetics, essential oils, and applications in traditional medicine and pest management. Various studies done on *Tagetes erecta* have reported its varying tolerance towards soil salinization. The plant exhibits adaptive responses including osmolyte accumulation, activation of antioxidant enzymes, and modulation of ion transport. Understanding these mechanisms is crucial for developing salt-tolerant cultivars and improving

sustainable cultivation practices under saline conditions. This paper consolidates experimental findings on the physiological, morphological, and biochemical responses of marigold under different concentrations and combinations of salt stress. The growth, morphological and physiological parameters of *Tagetes erecta* were evaluated under various combination and doses of salinity. Two doses of NaCl namely- 50 mM, 200 mM and two doses of combination of salts (including NaCl, Na₂SO₄, and CaCl₂) – E.C. 4 ds/m and E.C. 16 ds/m, alongwith control were utilized for the study. A significant decrease in root length and shoot length was observed with the increasing concentration of salinity in comparison with the control. Chlorophyll a and b concentrations in plants were also seen to decline under the set experimental conditions. In accordance with the present study, the amount of carotenoid and proline showed a hike with the increasing salt concentrations. Analysis of the current set of data evidently showed that 200 mM of NaCl was the most inhibitory dose while E.C. 4 ds/m was the least inhibitory dose for the growth of *Tagetes erecta* in comparison to that of control. The inhibition was found to be in the sequence 200 mM NaCl > 16 ds/m > 50 mM NaCl > 4 ds/m > Control.

Keywords: salt stress, marigold, NaCl, electrical conductivity, proline

COMPARATIVE GERMINATION RESPONSE OF PALMAROSA (*CYMBOPOGON SP.*) TO ARSENIC STRESS UNDER CONTROLLED PETRI-DISH CONDITIONS

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Abstract

Arsenic (As), a well-known contaminant of soil and water has emerged as a major environmental and agricultural concern worldwide, posing serious risks to plant growth, crop productivity, and human health. It commonly occurs in soils and water as inorganic species, primarily arsenate (As⁵⁺) and arsenite (As³⁺). Arsenite has been found to be more toxic to the plants although arsenate is highly prevalent in the soil. Both forms disrupt seed germination, root and shoot development, photosynthesis, and overall plant vigour. Plant responses to arsenic stress are highly species - dependent and influenced by developmental stage, environmental conditions, and the forms and concentrations of arsenic. While staple crops such as rice and wheat have been extensively studied, many economically important species remain underexplored. Investigating arsenic stress in novel plants, such as aromatic grasses like *Cymbopogon martinii* (Palmarosa), can provide insights into species-specific tolerance mechanisms, including antioxidant defense etc. Understanding these responses is essential for developing strategies for phytoremediation, sustainable cultivation in contaminated soils, and the identification of arsenic-tolerant plant varieties. In this study, seeds were exposed to graded concentrations of arsenate (0, 25, 50, 75, 100 µM) and arsenite (0, 25, 50, 75, 100 µM) under controlled petri-dish conditions. Germination indices—including germination percentage (GP), germination index (GI), seedling vigor index (SVI), and tolerance index (TI)— were evaluated to assess stress impact on the seeds. Arsenite caused a significantly stronger inhibitory effect at comparatively lower concentrations, reflected in reduced GP, GI, and SVI. In contrast, arsenate at higher concentrations produced moderate suppression of germination parameters, indicating comparatively lower toxicity. Tolerance indices further confirmed that Palmarosa seedlings maintained higher vigour under arsenate stress than under

arsenite-induced stress levels. Overall, the study establishes that this *Cymbopogon* sp. exhibits greater sensitivity to arsenite than to arsenate. These findings improve understanding of early-stage arsenic stress responses in Poaceae plants and provide a baseline for further physiological and biochemical investigations.

Keywords: arsenate, stress, germination, Palmarosa, arsenite.

TOTAL PHENOLIC CONTENT OF METHANOL EXTRACT FROM MEYNA SPINOSA

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Abstract

The present study investigates the total phenolic content (TPC) of the methanol extract of *Meyna spinosa* leaves, a medicinal plant traditionally used for its therapeutic properties. Phenolic compounds are vital secondary metabolites that contribute to antioxidant potential and disease prevention. The dried leaf powder of *Meyna spinosa* was extracted using methanol and analyzed by the Folin – Ciocalteu method with Gallic acid as the standard. Absorbance was measured at 765 nm using a UV-Vis Spectrophotometer. The methanol extract exhibits a considerable amount of total phenolic, indicating strong antioxidant potential. These findings highlight *Meyna spinosa* as a promising source of natural antioxidant and support its ethnomedicinal significance. Further studies are recommended to isolate and characterize its bioactive compound.

Keywords: *Meyna spinosa*, methanol extract, total phenolic content, Folin - Ciocalteu method, antioxidant activity.

GREEN SYNTHESIZED SILVER NANOPARTICLES FROM *MARSILEA MINUTA*, LINN AND THEIR POTENTIAL RELATED TO NEUROLOGICAL PROBLEMS

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Abstract

Marsilea minuta, Linn is heterosporous fern which belongs to the family Marsileaceae. It is an aquatic fern commonly called as pepperwort that has clover like leaf. *M. minuta*, Linn has tremendous effects in the treatment of epilepsy and insomnia and the phytochemicals that are present in the plant exhibit as drug for mental and nervous disorders. It also used to cure the cough, fever, pain and other inflammations. Silver Nanoparticle (AgNps) were produced using the ethanolic extract of *Marsilea minuta*, Linn. The raised Silver nanoparticles were examined for Scanning electron microscope (SEM) that shows the silver nanoparticles appeared like clustered and agglomerated structures which can reach up to 1-1.5 μm . This size may evident that these synthesized silver nanoparticle can penetrate through the brain cells and helps to treat the epilepsy, insomnia, nerve damage or inflammation in the brain. The synthesis suggest that the plant based nanoparticle are the safest option for the future drug discovery for various neurological applications.

Key Words: *Marsilea minuta*, Linn, Silver Nanoparticles, SEM and Neuro-related problems.

PRODUCTION OF SILVER NANOPARTICLES USING *ADIANTUM CAUDATUM*, LINN WITH APPLICATION TO SKIN HEALTH

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Abstract

Ferns are among the oldest vascular plants, with a rich evolutionary history. *Adiantum caudatum* belongs to the family Pteridaceae (Adiantaceae) and is notable for its cascading growth habit and unique reproduction strategy. Fronds of the *Adiantum caudatum*, Linn has the power to cure skin related diseases, cure for asthma, pulmonary disorder and diabetes. Silver Nanoparticles (AgNps) has the strong anti-microbial activity based on the plant and *Adiantum caudatum*, Linn has the potential anti-bacterial and healing properties. Silver nanoparticles of *Adiantum caudatum*, Linn has been visualized using Scanning Electron Microscope. The results indicates that large, rounded, smooth nanoparticle which is clustered in compact surface and size ranges from 150-300 nm were obtained when oxidized. The particles are tightly packed and indicates the strong potential of the same. These findings highlights that *Adiantum caudatum*, Linn is efficient and have promising phytochemicals for anti-microbial which is related to the skin diseases like acne, skin burns, rashes etc. and an ecofriendly compound.

Keywords: *Adiantum caudatum*, Linn, Silver Nanoparticles, SEM, and skin related disease.

ALLELOPATHIC EFFECTS OF *PIPER BETLE* (MAGAH PAAN) LEAF, STEM, AND ROOT EXTRACTS ON THE GERMINATION AND SEEDLING GROWTH OF *CICER ARIETINUM L.*

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Abstract

Piper betle (Magahi Paan) is a culturally and medicinally important climber widely cultivated in eastern India. In addition to its therapeutic significance, the plant contains diverse bioactive compounds that may exhibit allelopathic properties. The present study investigates the inhibitory effects of aqueous leaf, stem, and root extracts of **Piper betle** on the germination and early seedling development of Gram (*Cicer arietinum L.*). Laboratory experiments were conducted using different extract concentrations, with distilled water as the control. Results indicated that all extracts exhibited varying degrees of suppression on germination percentage, root length, shoot length, and overall seedling vigor when compared to the control. Among the tested plant parts, root extract showed the strongest inhibitory effect, followed by stem and leaf extracts. The reduced growth parameters suggest the presence of potent allelochemicals in *Piper betle*. These findings highlight that residues of Magahi Paan in agroecosystems may influence germination behavior of nearby crops and should be considered in crop planning and sustainable agricultural practices.

Keywords: *Piper betle*, Magahi Paan, Allelopathy, Germination, Seedling Growth, *Cicer arietinum*, Bioactive Compounds, Agricultural Sustainability.



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