ICAB SIVBV 2026

SOUVENIR

Hybrid mode

30 and 31 January, 2026

5th INTERNATIONAL CONFERENCE ON ADVANCES IN BIOTECHNOLOGY - SUSTAINABLE INNOVATIONS TOWARDS VIKSIT BHARAT VISION

Organized by

POST GRADUATE DEPARTMENT OF BIOTECHNOLOGY

DWARAKA DOSS GOVERDHAN DOSS VAISHNAV COLLEGE
(Autonomous)
Re-accredited by NAAC with A++ Grade, Affiliated to University of Madras
College with Potential for Excellence, Linguistic Minority Institution
Arumbakkam, Chennai - 106

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ABSTRACT PROCEEDINGS OF

5th INTERNATIONAL CONFERENCE OF ADVANCES IN BIOTECHNOLOGY SUSTAINABLE INNOVATIONS TOWARDS VIKSIT BHARAT VISION (ICAB SIVBV 2026)

EDITORIAL IN CHIEF:

Dr. M. D. BalaKumaran
Co-Convener, ICAB -SIVB 2026
Assistant Professor & Head,
PG Department of Biotechnology
Dwaraka Doss Goverdhan Doss Vaishnav College (Autonomous)

Dr. R. Ashwini
Organizing Secretary, ICAB -SIVB 2026
Assistant Professor,
PG Department of Biotechnology
Dwaraka Doss Goverdhan Doss Vaishnav College (Autonomous)

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POST GRADUATE DEPARTMENT OF BIOTECHNOLOGY

Dwaraka Doss Goverdhan Doss Vaishnav College
(Autonomous)
Re-Accredited by NAAC with A++ Grade in 3rd cycle
College with Potential for Excellence, Linguistic Minority Institution
Affiliated to University of Madras,
Arumbakkam, Chennai - 106

ORGANIZING COMMITTEE

SUB COMMITTEE MEMBERS

S. No	SUB COMMITTEE	CONVENERS
1.	Event Management	Dr. M. D. BalaKumaran Dr. R. Ashwini Dr. N. Senthil Kumar
2.	Registration Committee	Dr. S. N. Nisha
3.	Stage Committee	Dr. S. Uma Dr. M. Pavithra
4.	Speaker and Delegate hospitality	Dr. M. Pavithra
5.	Participants hospitality	Dr. K. Nithya
6.	Transportation Committee	Dr. G.K. Saravanan
7.	Presentation Committee	Dr. P. Indumathi Dr. G. Shoba Dr. G.K. Saravanan
8.	Scientific Committee	Dr. M. D. BalaKumaran Dr. R. Ashwini Dr. N. Senthil Kumar Dr. S. N. Nisha

ADVISORY COMMITTEE MEMBERS

Program Schedule
Inauguration Ceremony – Day 1

Sustainability is not a choice but a responsibility for future generations!

TIME	PROGRAM
08:30 am – 09:30 am	**Registration**
09:30 am – 09.35 am	**Welcoming the dignitaries to dais**
09:35 am – 09.40 am	**Lighting the Sacred lamp and Invocation**
09:40 am – 09:43 am	**Welcome address** **Dr. M.D. BalaKumaran** Assistant Professor & Head PG Department of Biotechnology
09:43 am – 09:45 am	**Opening Remarks of ICAB-SIVBV** **Dr. R. Ashwini** Assistant Professor PG Department of Biotechnology
09:45 am – 10:00 am	**Presidential Address** **Capt. Dr. S. Santhosh Baboo** Convener, ICAB SIVBV 2026 Principal, DGVC.
10:00 am – 10:05 am	**Secretary Address** **Shri Ashok Kumar Mundhra** Patron, ICAB SIVBV 2026 Secretary, DGVC.
10:05 am – 10.10 am	**Felicitation**
10:10 am – 10.15 am	**Release of Souvenir**
10:15 am – 10:25 am	**Inaugural Address** **Dr. U. Satyanarayana** Director (Research) and Professor Department of Biochemistry Dr. Pinnamaneni Siddhartha Institute of Medical Sciences, AP
10:25 am – 10:40 am	**Chief Guest Address** **Dr. Joseph Selvin** Dean School of Lifesciences Pondicherry University, Pondicherry.
10:40 am – 10:45 am	**Vote of Thanks** **Dr. N. Senthil Kumar** Assistant Professor PG Department of Biotechnology
10:45 am – 11:00 am	**Tea break**

DAY 1 – 30 January 2026

TIME	PROGRAM
11:00 am – 12:00 noon	**Plenary Lecture 1** **Dr. Wong Ling Shing** Professor and Pro Vice-Chancellor Research and Innovation INTI International University Malaysia ***Topic: Sustainable Research and Management practices for Biotechnology: Towards a greener future***
12:00 noon – 01:00 pm	**Plenary Lecture 2** **Dr. Kayeen Vadakkan** Senior Scientific Research Officer Amala Integrated Medical Research Department Amala Institute of Medical Sciences Kerala ***Topic: Quorum Sensing Inhibition in Nosocomial Pathogens: A Novel Anti-virulence Approach using Pseudomonas aeruginosa as a model***
01:00 pm – 02:00 pm	**Lunch break**
02:00 pm – 03:00 pm	**Plenary Lecture 3** **Dr. Julien Malard-Adam** Researcher, IFP – Institut français de Pudhucherry G-EAU, IRD, Université de Montpellier Montpellier, France ***Topic: வளர்ந்த நாட்டுக்காக விவசாயிகளின் பாரம்பரிய அறிவு மூலமாக நிலையான விவசாய புதுமைகள் Sustainable Agricultural Innovations through Farmers' Traditional Knowledge for a developed India.***
03:00 pm – 04:30 pm	**Panel Discussion** ***Translational Biotechnology: Converting Academic Research into Industrial Ventures***
03:00 pm – 04:30 pm	**Parallel session: Online Presentation (Oral and Poster) & Offline poster presentation**
04:30 pm	**Tea Break**

DAY 2 – 31 January 2026

TIME	PROGRAM	
09:30 am – 10:30 am	**Plenary Lecture 4** **Dr. SM Shiva Nagendra** Professor Department of Civil Engineering IIT Madras ***Topic: Air Pollution Hotspots: Challenges and Control Options***	
10:30 am – 10:45 am	**Tea break**	
10:45 am – 11:45 am	**Plenary Lecture 5 (online)** **Dr. Ini-Ibehe Nabuk Etim** Visiting Assistant Professor Institute of Oceanology, CAS China ***Topic: Slippery Lubricant Porous-Infused Surfaces for Materials Protection in the Oil and Gas Industries***	**Parallel Session: Offline Oral Presentation**
11:45 am – 12:45 pm	**Plenary Lecture 6 (online)** **Dr. Jayeeta Bhaumik** Scientist-E BRIC National Agri-Food and Biomanufacturing Institute, Punjab. ***Topic: Lignin 'The Brown Gold': A sustainable biopolymer with potential to contribute to Viksit Bharat***	**Parallel Session: Offline Oral Presentation**
12:45 pm – 01:30 pm	**Lunch Break**	
01:30 pm – 02:30 pm	**Plenary Lecture 7 (online)** **Dr. Bablu Kumar Dhar** Associate Professor Mahidol University International College, Salaya, Thailand ***Topic: The Sustainability Singularity: AI, Ethical Innovation, and the Future of Planetary Development***	**Parallel Session: Offline Oral Presentation**
02:30 pm – 03:30 pm	**Plenary Lecture 8** **Mr. K. Kishore** Senior General Manager – Manufacturing Kashiv Biosciences Ahmedabad ***Topic: From Molecule to Millions: Sustainable Biosimilar Manufacturing and Creating a Dream Career***	
03:30 pm – 03:45 pm	**Tea Break**	
04:00 pm – 05:00 pm	**Valedictory function & Prize distribution**	

Valedictory Function – Day 2

TIME	PROGRAM
04:00 pm – 04:05 pm	**Welcome address** **Dr. M.D. BalaKumaran** Assistant Professor & Head PG Department of Biotechnology
04:05 pm – 04:10 pm	**Conference Report** **Dr. R. Ashwini** Assistant Professor PG Department of Biotechnology
04:10 pm – 04:25 pm	**Principal Address** **Capt. Dr. S. Santhosh Baboo** Convener, ICAB SIVBV 2026 Principal, DGVC.
04:25 pm – 04.35 pm	**Valedictory Address** **Dr. C. Arul Vasu** Professor & Head Department of Zoology Controller of Examinations University of Madras, Chennai.
04:35 pm – 04:50 pm	**Prize Distribution**
04:50 pm – 04:55 pm	**Feedback**
04:55 pm – 05:00 pm	**Vote of Thanks** **Dr. N. Senthil Kumar** Assistant Professor PG Department of Biotechnology
05:00 pm	**National Anthem**

The journey of learning continues beyond this conference.!

Guests and Speakers - Day 1

Inauguration

Chief guest

Dr. Joseph Selvin
Dean, School of Lifescience,
Pondicherry University

Guest of Honor

Dr. U. Satyanarayana
Director (Research), Professor of Biochemistry
Dr. Pinnamaneni Siddhartha Institute of Medical Sciences, Andhra Pradesh.

Plenary session

Dr. Wong Ling Shing
Professor and Pro Vice-Chancellor
Research and Innovation
INTI International University
Malaysia

Dr. Kayeen Vadakkan
Senior Scientific Research Officer
Amala Integrated Medical Research Department
Amala Institute of Medical Sciences
Kerala

Dr. Julien Adam
Researcher
IFP – Institut français de Pudhucherry
G-EAU, IRD, Université de Montpellier
Montpellier, France

Speakers - Day 2

Dr. S.M. Shiva Nagendra
Professor
Department of Civil ENgineering
IIT Madras

Dr. Ini-Ibehe Nabuk Etim
Visiting Ass. Professor
Institute of Oceanology, CAS
China

Dr. Jayeeta Bhaumik
Scientist-E
BRIC National Agri-Food and Biomanufacturing Institute
Punjab.

Dr. Bablu Kumar Dhar
Associate Professor
Mahidol University International College
Salaya, Thailand

Mr. Kishore K
Senior General Manager – Manufacturing
Kashiv Biosciences
Ahmedabad

Panellists - Day 1

Moderator

Dr. M. Nithyakalyani
Chief Scientist
Rajiv Gandhi Government General Hospital and Madras Medical College
Founder & Director
Director of Cell2Cure Therapies and iGN biotech Private Limited
Chennai

Dr. D. J. Mukesh Kumar
Associate Professor (Research)
Department of Biochemistry
Saveetha Medical College and Hospital
Chennai

Dr. Janani Dakshinamoorthy
Founder & Director
GeneAura Pvt Ltd
Chennai

Mr. Anooj Raj
Founder & Director
Travancore Institute of Biosciences Research
Kerala.

Dr. V. Naveen Kumar
Founder & Director
ImmuGenix Biosciences Pvt. Ltd.
Chennai

Ms. K. Pavithra
Founder & Director
FSG FoodWorks OPC Pvt. Ltd.,
Chennai

Mr. Dinesh Boopalan
Senior Research Associate
Aragen Lifesciences Limited
Hyderabad

MESSAGES

In every walk with nature one receives far more than he seeks -John Muir

Dr. Joseph Selvin, FNASS
Professor,
Department of Microbiology,
School of Life Sciences,
Pondicherry University

MESSAGE

It gives me great pleasure to extend my warm greetings to the organizers, delegates, and participants of the 5th International Conference on "Advances in Biotechnology: Sustainable Innovations towards Viksit Bharat Vision", being held on 30th and 31st January 2026 at Dwaraka Doss Goverdhan Doss Vaishnav College, organized by the Post Graduate Department of Biotechnology.

Biotechnology stands at the forefront of addressing some of the most pressing global challenges, sustainable agriculture, environmental protection, healthcare innovation, and bio-based industrial development. In alignment with the Viksit Bharat Vision, this conference provides a timely and vital platform for researchers, academicians, industry experts, and students to exchange ideas, share cutting-edge research, and foster collaborations that translate scientific advancements into sustainable societal outcomes.

I commend the organizing team for their initiative in bringing together an international forum that promotes innovation, interdisciplinarity, and capacity building. I am confident that the deliberations and outcomes of this conference will significantly contribute to strengthening India's biotechnology ecosystem and inspire young minds towards responsible and impactful research. I wish the conference every success.

Dr. JOSEPH SELVIN, FNAAS
Professor
Department of Microbiology
School of Life Sciences
Pondicherry University

Dr. U. Satyanarayana
Director (Research) and Professor
Department of Biochemistry
Dr. Pinnamaneni Siddhartha Institute of Medical Sciences, AP

MESSAGE

I am delighted to know that the PG Department of Biotechnology, D.G Vaishnav College, Chennai is organising the 5th International Conference on Advances in Biotechnology on 30th and 31st January, 2026. As I understand this event coincides with the Silver Jubilee year of the PG Department of the college. My heartiest congratulations to the dedicated faculty members and the management of D.G. Vaishnav College.

I am confident that this conference will provide an opportunity to witness the outstanding contributions of researchers that will inspire the young participants to strengthen their professional growth and contribute to the well-being of the society.

I sincerely hope that the deliberations of this international conference will certainly contribute to the sustainable innovations towards Viksit Bharat Vision that will help India to emerge as a developed nation by 2047

I wish this conference a great success.

With all best wishes

Dr. U.Satyanarayana

VIT UNIVERSITY
(Estd. u/s. 3 of UGC Act 1956)

Dr. G. VISWANATHAN
Founder & Chancellor
Former Member of Parliament
Former Minister, Govt. of Tamil Nadu
President, Education Promotion Society for India, New Delhi

MESSAGE

It is with immense pleasure and deep appreciation that I extend my heartiest congratulations to the Post-Graduate Department of Biotechnology, Dwaraka Doss Goverdhan Doss Vaishnav College for organizing **the 5th International Conference on Advances in Biotechnology: Sustainable Innovations towards Viksit Bharat Vision (ICAB–SIVBV 2026)**. This prestigious conference scheduled to be conducted in hybrid mode on 30th and 31st January 2026 stands as a significant platform, bringing together a global community of scientists, academicians, researchers, and students.

In today's rapidly evolving world, science and technology have become inseparable from our daily lives, simplifying processes and enhancing efficiency, safety, and progress. Science enables us to understand the universe from the cellular level to the most complex systems, while technology translates these discoveries into practical applications that benefit society. This conference rightly emphasizes the ethical and responsible use of these disciplines for the collective welfare of humanity.

The theme of this conference highlights the pivotal role of biotechnology in achieving the Viksit Bharat Vision. Biotechnology has emerged as a cornerstone of modern advancement, revolutionizing healthcare through vaccines, diagnostics, and therapeutics, transforming agriculture through improved crop productivity and resistance, and driving industrial and environmental sustainability through biofuels, enzymes, and bioremediation technologies. By leveraging biological systems and technological advancements, the critical global challenges including food security, environmental health, and sustainable development can be effectively addressed.

I appreciate the entire team for organizing with a vision such a conference. Transformation of knowledge on such occasions yields fruits in terms of innovation, collaboration, and scientific excellence among participants.

I wish the conference every success and hope it contributes significantly towards shaping a sustainable and inclusive future.

Dr. G. Viswanathan
Founder & Chancellor

January 29, 2026

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Dr. Vijayanand Selvaraj, M.Sc., M.Phil., Ph.D.
Associate Professor
Bioresource Technology (BRT) Lab,
Department of Biotechnology,
Thiruvalluvar University,
Serkkadu, Vellore,
Tamil Nadu – 632 115.

MESSAGE

"When science serves sustainability, it transcends laboratories and becomes the architect of national destiny."

It is with profound pleasure that I extend my warm felicitations to the distinguished delegates, eminent scholars, industry leaders, and aspiring researchers participating in the *5th International Conference on Advances in Biotechnology – Sustainable Innovations Towards Viksit Bharat Vision (ICAB–SIVBV 2026),* convened on 30th and 31st January 2026. Hosted by the *Post Graduate Department of Biotechnology, Dwaraka Doss Goverdhan Doss Vaishnav College (Autonomous),* Chennai, this prestigious conference stands as a testament to academic excellence and visionary leadership, fostering global dialogue on transformative biotechnological advancements.

The conference theme, ***"Sustainable Innovations Towards Viksit Bharat Vision,"*** eloquently mirrors India's *Amrit Kaal* aspiration to emerge as a developed and self-reliant nation by 2047. By harmonizing cutting-edge biotechnology with national missions and the United Nations Sustainable Development Goals, the conference illuminates the profound social relevance of scientific innovation in addressing food security, public health, clean energy, environmental stewardship, and climate resilience. It reaffirms the role of biotechnology as a catalyst for inclusive growth, ecological balance, and societal progress.

I am confident that the scholarly deliberations and collaborative engagements of ICAB–SIVBV 2026 will inspire pioneering ideas and enduring partnerships, translating knowledge into meaningful societal impact. I commend the organizing committee for their unwavering commitment and extend my best wishes to all participants for a rewarding conference that contributes decisively to the realization of a sustainable and enlightened Viksit Bharat.

I congratulate the organizing committee, faculty members, and student volunteers for their dedicated efforts in curating this intellectually stimulating event. I wish all participants a rewarding conference experience filled with insightful interactions, productive deliberations, and enduring collaborations that will shape a resilient and sustainable future for our nation and beyond.

Best wishes for the grand success of ICAB–SIVBV 2026

(S. Vijayanand)

Dr. Kumaraswamy
Department Of Animal Genetics and Breeding
College of Veterinary Sciences & Animal Husbandry
Central Agricultural University (I)
Jalukie, Peren District, Nagaland – 797110

MESSAGE

I am happy to know that the PG Department of Biotechnology, Dwaraka Doss Goverdhan Doss Vaishnav College, Chennai, Tamilnadu, India – 600106 organizing "5th International Conference on Advances in Biotechnology – Sustainable innovations towards Viksit Bharat Vision (ICAB – SIVBV)" on January 30 and 31, 2026.

Today, we cannot expect our life without science and technology revolving around it. Science and technology are extremely essential in our everyday life as they have made things more simple, fast and secured. Science is the study of entire universe from the cellular level to the highest level; technology is the application arising from science! Hence, we need both of them in our life.

The science involves explanation, phenomenon, analysis and predictions on various subjects, technology is something that simplifies all these things. For instance, computers help scientists by storing big data, analyzing and organizing it. Undoubtedly, science and technology have made our life easier and faster. We should always hope, make an effort and ensure that the inventions and discoveries in these fields are always used for the benefit of entire human race! Henceforth, with the help of science and technology, let's make world a better place, for you, me & the entire human race!

Biotechnology is crucial for improving human life by revolutionizing in medicine by development of vaccines, diagnosis, therapeutics, etc., In agriculture. GM crops, higher yields, pest resistance. and in industry biofuels, enzymes. while also aiding environmental remediation and waste treatment. Its importance lies in using biological agents for large-scale production, developing new products, ensuring food security and creating sustainable solutions through genetic engineering.

I hope this international conference will bring all the scientist, students, teachers and experts working in the field of science and technology together to discuss, share and benefit each other. I wish the mega event in a great success. Thank you.

(P. KUMARASAMY)

Dr. Kalaivani Ganesan
Scientist F
Department of Biotechnology
Government of India
New Delhi-110003

MESSAGE

Congratulations to the Department of Biotechnology, DG Vaishnav College on this Silver Jubilee Year and commemorating it with a key international conference!

DGVC is one of the finest colleges in the country imparting quality science education over the decades and continues to attract talented young brains. The Department of Biotechnology at the University has done commendably well in promoting biotech research and education and has made a unique mark for itself in the 25 years of its inception.

At this juncture, when the Government of India is spearheading the BioE3 Policy for a Bio-based future towards Viksit Bharat goals, I am pleased to note that the conference has been conceived on this important scientific advancement and its future with eminent speakers. The learnings from this will have a huge impact on the bioscience community.

I wish the conference a grand success and my best wishes to the faculty, students, speakers and all the participants.

Dr. Ranjithkumar Rajamani, Ph.D., YDHA., FERA.,
Vice President,
Einsteen Research Academy, India.

MESSAGE

The rapid increase in the global population, along with climate change, rising carbon emissions, and the growing accumulation of pollutants in water resources, poses serious challenges to society, the environment, and sustainable development worldwide. It is time for all of us to work together toward achieving the Sustainable Development Goals (SDGs) to overcome these challenges for present and future generations.

The 5 th International Conference on Advances in Biotechnology focuses on fostering sustainable and innovative biotechnological solutions that align with the Viksit Bharat Vision. The conference serves as a global platform for researchers, academicians, industry professionals, and policymakers to exchange knowledge, showcase cutting-edge research, and promote biotechnology-driven strategies for sustainable development and national growth.

This event provides a valuable opportunity to take part in meaningful discussions, share research findings, and work together to develop innovative solutions for a more sustainable world. The ICAB–SIVBV-2026 meeting aims to enhance understanding of ecosystems and highlight their important contributions to society and human well-being. I sincerely thank the respected members of the organizing committee for their dedicated efforts and warmly congratulate them on the successful organization of this event. ICAB–SIVBV-2026 will showcase the pathway toward a Viksit Bharat, envisioning a self-reliant, inclusive, and sustainable India and a sustainable world, by empowering growth through innovation, education, and technology.

வாழ்க வளமுடன்

Mr. Allen Luneta,
Dean of Health Sciences,
DMI – St. Eugene University
Zambia

MESSAGE

I am pleased to extend my heartfelt greetings to all the participants of this academic event. It is encouraging to witness such initiatives that aim to strengthen academic standards, research culture, and professional competence among faculty members and scholars.

The theme and objectives of this programme reflect the institution's commitment to quality education, innovation, and sustainable development. Programmes of this nature foster critical thinking, collaborative research, and the exchange of best practices, which are essential for academic and societal advancement.

I congratulate the organizers for their meticulous planning and sincere efforts in bringing together experts and learners on a common platform. I am confident that this programme will be a rewarding and enriching experience for everyone involved.

I wish the event every success and convey my best wishes to the organizers and participants.

Dr. C. Ramalakshmi
Quality Assurance Officer/ Senior lecturer
DMI – St. Eugene University
Zambia

MESSAGE

It gives me immense pleasure to convey my warm greetings to the organizers, speakers, delegates, researchers, academicians, industry experts, and students participating in this prestigious academic programme.

Academic conferences and professional development programmes play a vital role in promoting knowledge sharing, innovation, and collaborative learning. Such platforms provide an opportunity to exchange ideas, explore emerging trends, and address contemporary challenges through research and interdisciplinary approaches.

I commend the organizing team for their dedicated efforts in planning and executing this meaningful academic initiative. I am confident that the deliberations and interactions during this programme will be intellectually stimulating and will contribute significantly to professional growth and institutional excellence.

I wish the programme great success and extend my best wishes to all the participants.

Dr. R. Sakthivel
Registrar/ Professor
DMI – St. Eugene University
Zambia

MESSAGE

It gives me great pleasure to convey my warm greetings to the organizers, delegates, researchers, academicians, industry professionals, and students participating in the 5th International Conference on Advances in Biotechnology – Sustainable Innovations Towards Viksit Bharat Vision (ICAB-SIVBV 2026).

Biotechnology plays a pivotal role in addressing global challenges related to health, food security, energy, environment, and sustainable development. The theme of this conference aptly aligns with the vision of Viksit Bharat 2047 and the United Nations Sustainable Development Goals, highlighting the importance of innovative, inclusive, and sustainable scientific advancements.

I appreciate the Post Graduate Department of Biotechnology, Dwaraka Doss Goverdhan Doss Vaishnav College, for organizing this international forum that brings together researchers, academicians, industrialists, and young innovators from diverse backgrounds. Such conferences foster knowledge exchange, encourage interdisciplinary collaboration, and inspire future-ready research that benefits society at large.

I am confident that the deliberations, presentations, and interactions during this conference will be intellectually enriching and will contribute meaningfully to scientific progress and sustainable development.

I wish the conference every success and extend my best wishes to all the participants.

Dwaraka Doss Goverdhan Doss Vaishnav College
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DIAMOND JUBILEE YEAR 1964-2024

Ashok Kumar Mundhra
Secretary

MESSAGE FROM PATRON

India is a civilization rooted in ancient wisdom, rich cultural heritage, and values that emphasize harmony with nature, ethical living, and responsible use of resources. Long before sustainability became a global concept, our traditions advocated *"Vasudhaiva Kutumbakam"*—the world as one family—highlighting the need to protect nature for the welfare of all. In the present era of rapid scientific and technological advancement, it is essential that modern progress remains anchored in these timeless Indian values.

The nation has embarked on the transformative *Viksit Bharat Vision 2047*, which envisions India as a developed, self-reliant, and sustainable nation by the centenary year of our independence. This vision places strong emphasis on innovation, indigenous research, environmental responsibility, and youth empowerment as the pillars of national development.

Biotechnology plays a pivotal role in realizing this vision by offering sustainable solutions in healthcare, agriculture, environmental management, and industrial development. From eco-friendly bio-products and green technologies to advanced therapeutics and disease management, biotechnology stands as a key driver of scientific progress aligned with national priorities. It also offers immense opportunities for students to contribute meaningfully to society through research, innovation, and ethical scientific practice.

In this context, I am pleased to note that the Post Graduate Department of Biotechnology is organizing the *International Conference on Advances in Biotechnology – Sustainable Innovations towards Viksit Bharat Vision*. This conference provides an excellent platform for academicians, researchers, industry experts, and students to deliberate on emerging trends, share knowledge, and foster sustainable innovations that contribute to national and global development.

Such academic endeavors not only enhance scientific understanding but also nurture discipline, responsibility, and a spirit of service among students. I am confident that this conference will inspire young minds to pursue excellence in biotechnology while remaining firmly rooted in Indian culture and moral values.

I extend my best wishes to the organizing committee, faculty members, and students for the successful conduct of this conference and pray that it contributes significantly towards building a strong, sustainable, and prosperous *Viksit Bharat*.

SECRETARY

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DIAMOND JUBILEE YEAR 1964-2024

Dr. S. Santhosh Baboo, M.Sc., Ph.D.,
Principal
Member Syndicate, University of Madras

MESSAGE FROM CONVENER

Sustainability has become one of the most important concerns of the present generation, especially in an era marked by rapid technological advancement and growing environmental challenges. Increasing pollution, climate change, the emergence of new diseases, and frequent natural calamities compel us to reflect on the direction of scientific progress and its long-term impact on society. In this context, sustainable development is no longer an option, but a responsibility that must guide research, innovation, and industrial growth.

Across the globe, sustainability has been integrated into various sectors of manufacturing and production, ranging from building construction and agriculture to healthcare, pharmaceuticals, and drug development. Scientific research plays a pivotal role in this transition by enabling the development of eco-friendly technologies, sustainable materials, and innovative solutions that balance progress with environmental stewardship. Meaningful research today must not only answer scientific questions but also address societal needs.

In alignment with these global efforts, our nation has embarked on several visionary initiatives aimed at inclusive and sustainable growth. The *Viksit Bharat Vision 2047* is a landmark national mission that envisions transforming India into a developed, self-reliant, and sustainable nation by the centenary year of our independence. This vision places strong emphasis on innovation, indigenous research, and the active participation of academic institutions in nation-building.

In this context, I am pleased to note that the Post Graduate Department of Biotechnology is organizing the *International Conference on Advances in Biotechnology – Sustainable Innovations towards Viksit Bharat Vision*. This conference provides a valuable platform for academicians, researchers, students, and industry professionals to engage in meaningful dialogue, share research findings, and explore emerging trends in biotechnology that support sustainable development.

Such scholarly interactions encourage critical thinking, foster collaboration, and inspire young minds to pursue research with purpose and social relevance. I am confident that this conference will contribute significantly to advancing sustainable biotechnological solutions and strengthening both national and global academic discourse.

I extend my best wishes to the organizing committee for the successful conduct of this conference and appreciate their dedicated efforts in organizing this significant academic event.

I also extend a warm welcome and best wishes to all the delegates participating in the conference.

PRINCIPAL

Dr. M. D. BalaKumaran
Co Convener, ICAB SIVBV 2026
Assistant Professor & Head
PG Department of Biotechnology

MESSAGE

It gives me immense pleasure to extend my heartfelt greetings on the occasion of the 5th International Conference on Advances in Biotechnology – Sustainable Innovations towards Viksit Bharat Vision, organized by the Postgraduate Department of Biotechnology.

Over the years, our department has steadily grown into a vibrant hub of academic excellence, research innovation, and societal impact. From modest beginnings, we have nurtured a culture of inquiry and collaboration that now resonates across national and international platforms. This conference stands as a testimony to our collective commitment to advancing biotechnology in alignment with the Sustainable Development Goals (SDGs), ensuring that our scientific endeavors contribute meaningfully to global sustainability and human welfare.

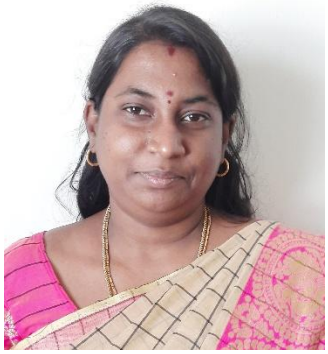
The theme of this conference, *Sustainable Innovations towards Viksit Bharat Vision*, reflects our dedication to channeling biotechnology for the holistic development of our nation. By integrating cutting-edge research with sustainable practices, we aspire to contribute to the vision of a self-reliant, progressive, and inclusive Bharat. The deliberations and knowledge exchange during this conference will undoubtedly inspire new pathways for innovation, collaboration, and impactful outcomes.

As the Co-convener of this prestigious conference, I feel honoured to be part of this collective effort that has brought together distinguished academicians, researchers, industry experts, and students from across the globe. The dedication and teamwork of all involved have ensured that this event serves as a vibrant platform for meaningful dialogue and knowledge sharing. I warmly welcome and extend my best wishes to all participants, whose valuable contributions will enrich the deliberations and strengthen our shared pursuit of sustainable biotechnology.

May this conference serve as a beacon of inspiration, fostering collaborations that transcend boundaries and innovations that shape a better tomorrow.

With best wishes,

M.D.BALAKUMARAN



Dr. R. Ashwini
Organizing Secretary, ICAB SIVBV 2026
Assistant Professor
PG Department of Biotechnology

MESSAGE

It is with immense pride and pleasure that I present the **5th International Conference on Advances in Biotechnology: Sustainable Innovations Towards Viksit Bharat Vision (ICAB-SIVBV 2026)**, organized by the PG Department of Biotechnology, Dwaraka Doss Goverdhan Doss Vaishnav College (Autonomous), Chennai.

At a time when scientific innovation is central to addressing global and national challenges, this conference provides a timely platform to deliberate on the transformative role of biotechnology in shaping a sustainable and resilient future. ICAB-SIVBV 2026 is designed to bridge cutting-edge research with societal needs, aligning scientific excellence with India's aspiration of becoming a developed nation under the *Viksit Bharat Vision*.

The conference emphasizes key thematic areas including biotechnology-driven innovations, allied life sciences, green energy solutions, and sustainable agriculture. These domains collectively highlight how molecular-level discoveries can be translated into scalable solutions for macro-level challenges such as food security, climate adaptation, environmental sustainability, and equitable healthcare.

By bringing together eminent academicians, industry experts, researchers, and young scholars from across the globe, ICAB-SIVBV 2026 fosters interdisciplinary dialogue, knowledge exchange, and collaborative partnerships. The deliberations, technical sessions, and interactions are expected to inspire innovation, encourage translational research, and strengthen the link between academia, industry, and society.

I am confident that this conference will serve as a catalyst for meaningful scientific engagement and will contribute significantly to nurturing future-ready researchers and innovators. I extend my sincere appreciation to all speakers, delegates, advisory committee members, sponsors, and organizing team whose dedicated efforts have made this conference possible.

R. Ashwini

Dr. N. Senthil Kumar,
Organizing Secretary, ICAB SIVBV 2026
Assistant professor
PG Department of Biotechnology

MESSAGE

The PG Department of Biotechnology, Dwaraka Doss Goverdhan Doss Vaishnav College (Autonomous), Arumbakkam, Chennai, is delighted to organize the 5th International Conference on Advances in Biotechnology – Sustainable Innovations Towards Viksit Bharat Vision (ICAB–SIVBV 2026) to be held in Hybrid Mode on 30 & 31 January 2026.

Biotechnology stands at the forefront of scientific innovation, playing a pivotal role in addressing global challenges related to healthcare, food security, energy sustainability, and environmental protection. In alignment with India's Viksit Bharat Vision, this conference aims to provide a vibrant platform for researchers, academicians, industry experts, and young innovators to share knowledge, exchange ideas, and foster collaborations that drive sustainable development.

The central theme, "Sustainable Innovations Towards Viksit Bharat Vision," emphasizes the integration of cutting-edge biotechnological advancements with sustainability goals. The conference will cover a broad spectrum of emerging areas including Biotech Innovations, Green Energy, Sustainable Agriculture, Healthcare Technologies, AI in Life Sciences, Nanotechnology, Food Biotechnology, Environmental Protection, and allied disciplines. Through keynote lectures, plenary talks, oral and poster presentations, ICAB–SIVBV 2026 seeks to highlight innovative research and translational approaches that contribute to national growth and global well-being.

This international forum also aims to encourage interdisciplinary research, promote industry–academia interaction, and inspire students and young researchers to pursue impactful scientific careers. The hybrid mode of the conference ensures inclusive participation, enabling global engagement and wider dissemination of knowledge.

We extend a warm invitation to all participants and stakeholders to be a part of ICAB–SIVBV 2026 and contribute towards shaping a sustainable, innovative, and self-reliant India. We look forward to your active participation and valuable contributions that will make this conference a meaningful and memorable scientific event.

N. Senthil Kumar

PLENARY LECTURES

Nature is not a place to visit, it is home

–Gary Snyder

Sustainable research and management practices for biotechnology: Towards a greener future

Dr. Wong Ling Shing, Ph.D., P. Tech.
Professor and Pro Vice-Chancellor
Research and Innovation
INTI International University
Malaysia

ABSTRACT:

Sustainable research and management practices in biotechnology are vital to realizing the Viksit Bharat vision of a developed India by 2047. These practices enable science to address urgent global challenges—such as climate change, pandemic preparedness, food security, and waste management—through collaboration and ethical innovation. Success depends on transcending traditional research silos by fostering interdisciplinary and transdisciplinary collaboration. Notable advances in agro-waste biocomposites, microalgae biofuels, and water quality biosensors exemplify how cross-disciplinary approaches yield practical, sustainable solutions for a greener future. An advanced society is characterized by effective technology and resource sharing to optimize funding and infrastructure, alongside robust data management and open science practices that enhance transparency and impact. Equally important is cross-cultural collaboration, which broadens perspectives and expertise. Underpinning all progress must be a strong ethical framework and respect for intellectual property, ensuring responsible and equitable outcomes. By promoting shared knowledge through conferences, joint publications, and international partnerships, the academic community can accelerate the transition toward sustainability. This integrated approach establishes biotechnology as a key driver in building a resilient, green, and developed global society.

Quorum Sensing Inhibition in Nosocomial Pathogens: A Novel Antivirulence Approach Using Pseudomonas aeruginosa as a Model

Dr. KayeenVadakkan , M.Sc, Ph.D,(D.Sc)
Scientist C
Senior Scientific Research Office
Amala Integrated Medical Research Department
Amala Institute of Medical Sciences, Thrissur, Kerala, India. 680555

ABSTRACT:

The persistent rise in nosocomial infections caused by multidrug-resistant organisms presents a significant challenge to global healthcare systems. Among these pathogens, Pseudomonas aeruginosa is particularly notorious due to its intrinsic resistance mechanisms, biofilm-forming ability, and tightly regulated expression of virulence factors. Central to its pathogenicity is a hierarchically organized quorum sensing (QS) network that facilitates intercellular communication and coordination of group behaviors. The QS circuitry in P. aeruginosa is predominantly governed by the LasIR and RhlIR systems, which utilize N-3-oxododecanoyl homoserine lactone and N-butyryl homoserine lactone, respectively, to modulate the expression of genes associated with host colonization, immune evasion, and persistence in clinical settings.

Targeted disruption of QS, referred to as quorum sensing inhibition (QSI), has emerged as a promising antivirulence strategy. By interfering with bacterial communication rather than growth, QSI minimizes the selective pressure associated with traditional antibiotics, thereby reducing the likelihood of resistance development. Recent investigations into small molecule inhibitors, phytocompounds, and nanoparticle-based delivery platforms have demonstrated significant attenuation of P. aeruginosa virulence and biofilm integrity in vitro and in vivo. Emphasis on translational relevance underscores the potential of QSI as a supplementary or standalone modality in the prevention and management of device-associated and intensive care unit infections.

வளர்ந்த நாட்டுக்காக விவசாயிகளின் பாரம்பரிய அறிவு மூலமாக நிலையான விவசாய புதுமைகள்

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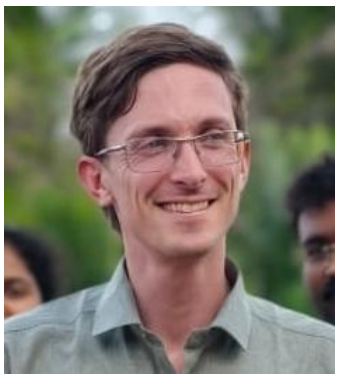


Dr. Julien Malard-Adam
Researcher, IFP – Institut français de Pudhucherry
G-EAU, IRD, Université de Montpellier
Montpellier, France
Visiting Professor, TNAU, Coimbatore.

சுருக்கம் –

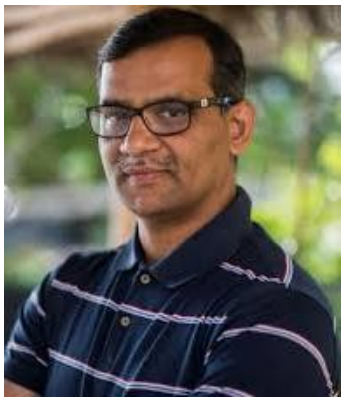
உலகங்கெங்கிலும் விவசாயத்தின் நிலைத்தன்மைக்காக இயற்கை வேளாண்மை செய்யும்முறைகளைப் பயன்படுத்த வேண்டிய நிலை ஆகிவிட்டது. இச்செய்யும்முறைகளின் அடிப்படைப் பஞ்சகாவியா, தாவரிய பூச்சிவிருட்டிகள் மற்றும் நாட்டு விதைகளைப் போன்று விவசாயிகளின் பாரம்பரிய அறிவுகள் மற்றும் தொழில்நுட்பங்கள் ஆகும். இத்தொழில்நுட்பங்கள் பாரம்பரியமானவை என்பது கூறிப்படுகின்றன என்பதாலும், இவற்றின் உற்பத்தி மற்றும் பயன்பாட்டில் பலவிதமான புதுமைகளை விவசாயிகள் தினந்தோரும் கண்டுப்பிடித்து கொண்டு வருகிறதால் இயற்கை வேளாண்மையை ஒரு புதுமையான புலமாக புரிந்து கொள்ள வேண்டியது. விவசாயிகளின் இப்புதுமைகளை கண்டுப்பிடித்து, வேவ்வெறு சூழல்நிலைகளில் அவற்றின் விளைவுகளை மதிப்பிட்டு பெரிய அளவில் விரிவாக்கம் செய்ய பாரத நாட்டின் வளர்ச்சிக்காக ஒரு மிக்க முக்கியமான சுவாலும் வாய்ப்பும் ஆகும்.

Sustainable Agricultural Innovations through Farmers' Traditional Knowledge for a developed India

ABSTRACT:

Across the world, the need has arisen to adopt natural farming methods for the sustainability of agriculture. The foundation of these methods lies in traditional knowledge and technologies of farmers, such as Panchagavya, herbal pest repellents, and native seeds. Although these technologies are described as traditional, farmers are constantly discovering various innovations in their production and application. Therefore, natural farming should be understood as an innovative field. Identifying these innovations of farmers, evaluating their effects in different environmental conditions, and scaling them up is a crucial challenge and opportunity for the development of India.

Air Pollution Hotspots: Challenges and Control Options



Dr. S. M. Shiva Nagendra
Professor
Department of Civil Engineering
IIT Madras

Abstract:

Air pollution in urban environments shows strong spatial and temporal variability due to heterogeneous emission sources, micrometeorology and urban land use. This heterogeneity results in the formation of localized "air pollution hotspots" such as traffic intersections, landfill sites, parking areas, and industrial clusters in cities. In urban areas, air quality information is provided to public in the form of air quality index (AQI). The AQI values are estimated from fixed air quality monitoring stations. These fixed stations are unable to capture the air quality beyond certain radius (500 m), the estimated AQI is location specific and cannot represent actual spatial variation of the air pollutants in the urban environment. In this talk, the air quality characteristics in urban hotspots such as commercial area, industrial area, waste management site and busy urban corridors will be discussed. The novel methods for management of hotspot air quality in urban areas such as low-cost sensors monitoring, real-time exhaust emission prediction models and selected air pollution control technologies will also be covered.

Slippery Lubricant Porous-Infused Surfaces for Materials Protection in the Oil and Gas Industries

Dr. Ini-Ibehe Nabuk Etim
Visiting Assistant Professor
Institute of Oceanology, CAS
China

ABSTRACT:

In recent years, there have been global awakenings amongst scientists on the bacterial deterioration of materials in the marine environment, a process commonly known as microbially-influenced corrosion (MIC). This report will focus on the evaluation of the effect of sulfate-reducing bacteria (SRB) on the corrosion of mild steel in concrete environments. The mitigation methods such as the use of organic silicon quaternary ammonium salt (OSA) and slippery-lubricant infused porous surfaces (SLIPS) will be presented. One of our findings showed that SRB growth had optimized sessile cells in the early immersion periods but reduced with extending the time. Consequently, the sessile cells induced the breakdown of the passive film through metabolic reactions of SRB. The corrosion resistance reflected by surface morphologies and electrochemical analysis showed that the corrosion rate was higher in media containing SRB compared to media without SRB. This aspect of research is significant as it is in line with the innovations in ecofriendly construction and the Sustainable Development Goals (SDGs).

Lignin 'The Brown Gold': A sustainable biopolymer with potential to contribute to Viksit Bharat

Dr. Jayeeta Bhaumik,
Scientist-E,
BRIC-National Agri-Food and Biomanufacturing Institute (BRIC NABI), Sector 81 (Knowledge City),
Mohali, Punjab

ABSTRACT:

Lignin, often called "The Brown Gold," is a complex, aromatic biopolymer derived from plants. As the second most abundant natural polymer after cellulose, it is gaining recognition as a critical asset for Viksit Bharat 2047, India's vision of becoming a developed and self-reliant nation. Traditionally treated as a low-value byproduct of the paper and pulp industry and burned for energy, lignin is being repositioned as a high-value sustainable raw material.

Lignin valorization lab of BRIC NABI (India's first Biomanufacturing institute) has been instrumental for past one decade in developing lignin-based biomaterials includings coatings, films, hydrogels, nanomaterials, biofertilizers, biopesticides for pharmaceutical, cosmeceutical as well as agricultural applications. Multiple patents have been filed and industry connect has been made with aim for technology licensing and product commercialization. BRIC NABI's BIRCA funded BioNEST incubation center and DBT funded biofoundry hub is a great support for scale up, incubation and lignin-based product commercialization. Taken together, it is envisioned that lignin-based technologies can contribute to Viksit Bharat by creating sustainable products, boosting economy and creating jobs.

The Sustainability Singularity: AI, Ethical Innovation, and the Future of Planetary Development

Dr. Bablu Kumar Dhar
Associate Professor
Mahidol University International College
Salaya, Thailand

ABSTRACT:

Humanity is approaching a historic inflection point where accelerating technological capabilities intersect with rising environmental and social pressures. In this keynote, I introduce Sustainability Singularity Theory (SST)—a forward-looking framework that explains how the convergence of Artificial Intelligence (AI), ethical governance, climate innovation, and green economic transformation is reshaping the future of business, society, and sustainable development.

SST proposes that as intelligent systems begin to predict, optimize, and autonomously manage energy, resources, and ecological risks, sustainability transitions will become self-reinforcing, ethically guided, and increasingly autonomous. The talk explores how AI-driven climate models, circular production systems, digital carbon markets, renewable microgrids, and ESG-aligned business strategies are pushing societies toward a stage where sustainability becomes embedded into the very functioning of economic and technological systems.

Drawing from global evidence, empirical insights, and real-world policy innovations, this keynote discusses three critical dimensions:

1. AI as a catalyst for climate resilience and resource efficiency,
2. Ethical innovation and planetary justice as central drivers of sustainable business transformation, and
3. The path toward a Type 1 civilization, where human intelligence and machine intelligence jointly advance a fairer, greener, and more resilient world.

The keynote offers a strategic roadmap for business leaders, policymakers, and researchers navigating the next decade of sustainability challenges and opportunities.

From Molecule to Millions: Sustainable Biosimilar Manufacturing and Creating a Dream Career

Mr. K. Kishore
Senior General Manager – Manufacturing
Kashiv Biosciences
Ahmedabad

SUMMARY:

The first part of the session will explore how advances in biotechnological manufacturing transform laboratory discoveries into affordable, high-quality medicines for millions, emphasising the role of sustainable biosimilar manufacturing in supporting healthcare access and environmental responsibility. Real-world manufacturing examples will illustrate innovations in water and energy optimisation, digitalisation, quality culture, and scalable green manufacturing practices that directly contribute to national development goals.

The second segment, “Creating a Dream Career”, Most students feel that their admission to a good college guarantees them a great career ahead. It is necessary for them to take full accountability for their learning and actions to build a strong foundation for their Dream Career. It will cover the path to a dream job, building a strong profile, and creating a personal brand.

OFFLINE ORAL PRESENTATIONS

If you truly love nature, you will find beauty everywhere –Vincent van Gogh

BIOTECHNOLOGY IN HEALTH & THERAPEUTICS

(OP-HT1 – OP-HT33)

Biotechnology has revolutionized medical care and treatment in the past decade - Dr Robert Read

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OP-HT1

ANTICANCER ACTIVITY OF MARINE ALGA – *Zonaria crenata* J. AGARDH

Vasanth. M[1] and Shyamala Gowri. S[2*]

[1]Research Scholar (Ph. D – Part-time), PG and Research Department of Botany, Pachaiyappa's College (Affiliated to University of Madras), Chennai – 600030.
[2*]Assistant professor, PG and Research Department of Botany, Pachaiyappa's College (Affiliated to University of Madras), Chennai – 600030.
***Corresponding author Email Id: shyamalagowri1985@gmail.com**

Abstract

Marine seaweeds, also known as macroalgae, are abundant in coastal regions around the globe. Over the past fifty years, researchers have identified bioactive compounds with novel structures from these seaweeds, making them a rich source of pharmacologically and biologically potent natural products. This study investigated the in-vitro cytotoxic effects of Ethyl Acetate extract (EAZ), Ethanol extract (ETZ), and Cisplatin on the MCF-7 breast cancer cell line. Treatments at varying concentrations over 48 hours revealed a clear dose-dependent cytotoxic response, with higher concentrations producing greater inhibition of cell viability. The half-maximal inhibitory concentration (IC_{50}) values were determined as 86.70 µg/mL for EAZ, 108.47 µg/mL for ETZ, and 14.68 µg/mL for Cisplatin. Among the tested agents, Cisplatin exhibited the strongest cytotoxic activity, while EAZ and ETZ also demonstrated significant concentration-dependent effects. These findings highlight the potential of EAZ and ETZ as candidate compounds for further anticancer evaluation. In addition, we recommend investigating the medicinal properties of seaweeds from coastal areas as potential sources of bioactive compounds. Further research into seaweed bioactivity could lead to the discovery of novel antibiotics and therapeutic agents.

Keywords: Seaweeds, MCF-7, Breast cancer cell line, $IC_{50,}$ Cytotoxic activity, Therapeutic agents.

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OP-HT2

IN-SILICO DESIGNING OF Si-RNA FOR POST TRANSCRIPTIONAL GENE SILENCING OF HIV TO INHIBIT REPLICATION, INFECTION AND NEUTRALIZING THE IMMUNITY INSIDE THE HOST

Saravanakrishnan U[1] and Veni S S[2]*

[1,2]Department of Biotechnology, Saveetha School of Engineering
Corresponding author mail id : venivelavan13@gmail.com

Abstract

This project evaluates the compatibility and therapeutic potential of a specific high-stability Small Interfering RNA (siRNA) against Human Immunodeficiency Virus type 1 (HIV-1). While standard RNA interference (RNAi) protocols often utilize 21-nucleotide sequences, this study investigates the efficacy of a 14-nucleotide, high-GC (85%) siRNA motif. The study focuses on three distinct functional modules of the HIV genome: viral replication (Gag/Pol), infection entry (Env/Vif), and host immunity neutralization (Nef/Vpu). The viral genome was retrieved from the NCBI database, and Open Reading Frames (ORFs) were identified using NCBI ORF Finder. The specific 14-nucleotide siRNA sequence was then aligned against these targets to assess binding frequency and the resulting disruption of the Open Reading Frame (ORF). The results demonstrate that the designed siRNA repeatedly attaches to critical G-rich regions within the viral genome, leading to a significant theoretical reduction in the amino acid length of the viral proteins, thereby rendering them non-functional.

Keywords: Human Immunodeficiency Virus type 1 (HIV-1), Small Interfering RNA, Open Reading Frame, Infectivity , Immunity Neutralization , Replication.

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OP-HT3

ISOLATION AND IDENTIFICATION OF NOVEL PHYTOCHEMICAL METABOLITE FROM INDIGENOUSE MEDICINAL PLANT AND EVALUVATION OF ITS BIOACTIVITY

Ms. Anli Dino, Madeehah*, Anjanha R, Aloysius Rancy A, Poshika B T

St. Joseph's College of Engineering, OMR, Chennai-600119
***Corresponding author : madee0427@gmail.com**

Abstract :

The Fabaceae family is widely distributed in the world and includes *Psoralea corylifolia L*. *P. corylifolia* seeds have been used in traditional Chinese and Indian medicine for treating various diseases such as jaundice, leprosy, and heart diseases. An ethnobotanical study concerning traditional healers of the Marathwada region of Maharashtra, India, reported that this plant was being used for the treatment of skin disorders, dysentery, and diarrhea. The current study tries to evaluate the antibacterial, antifungal, and antioxidant activities of a quercetin analogue isolated from *P. corylifolia* by using in vitro methods. Preparation of methanolic extract of *P. corylifolia* seeds has been carried out. Phytochemical screening, estimation of total phenolics/flavonoids, and antioxidant activity using a method based on the scavenging activity of the 2,2-Diphenyl-l-picrylhydrasyzal radicals are demonstrated. Antimicrobial activity has been demonstrated against two different strains by employing the agar well method. TLC has been used to check the presence of any compounds in the methanolic extract of the seeds. Using the TLC method, the presence of quercetin analogues has been detected.

Further, the selected extract was investigated for its inhibitory activity towards the growth of the fungus Rhizopus as well as the growth of two bacteria, *Escherichia coli* and *Staphylococcus aureus*. By using the purified compounds, the inhibitory areas were calculated. This study proved that the seed extract has a strong inhibitory activity towards bacteria as well as a fungus. Therefore, the study emphasizes the identification of the compounds from *P. corylifolia* and their potential activities.

Keywords: *Psoralea corylifolia*, quercetin analogue, antibacterial activity, antifungal activity, antioxidant activity, Thin Layer Chromatography (TLC)

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OP-HT4

PHYTOCOMPOUND-MEDIATED SYNERGISTIC SUPPRESSION OF NDM-1 ACTIVITY AND RESTORATION OF B-LACTAM EFFICACY IN *Escherichia coli* BL21 (DE3)

Logesh R[1*], Mohammed Abdul Cader Aamir[1], Md Khurshid Alam Khan[1*]

[1]School of Life Sciences, B.S.A Crescent Institute of Science and Technology, Vandalur, Chennai, Tamil Nadu India – 600 048.
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Abstract:

NDM-1–mediated carbapenem resistance represents a major clinical challenge and significantly limits the therapeutic effectiveness of β-lactam antibiotics. In the present study, an integrated computational and experimental approach was employed to identify phytocompounds capable of inhibiting New Delhi Metallo-β-lactamase-1 (NDM-1). Virtual screening of approximately 300 phytocompounds followed by molecular docking against the NDM-1 crystal structure (PDB ID: 6XBF) shortlisted compounds exhibiting higher binding affinity than the reference drug meropenem (−6.97 kcal/mol). Based on docking performance and conserved active-site interactions, the top-ranking candidates were selected and further evaluated using in silico ADMET analysis, leading to the identification of three non-toxic phytocompounds—Oleanolic acid (OA), Ursolic acid (UA), and Reserpine (Res). Molecular dynamics simulations confirmed stable interactions for all three NDM-1–ligand complexes. Antimicrobial susceptibility testing against *Escherichia coli* BL21 (DE3) harbouring pET24a-NDM1 revealed minimum inhibitory concentrations of 16 µg/mL for meropenem, 512 µg/mL for OA, and 1024 µg/mL for both UA and Res. Checkerboard assays demonstrated a pronounced synergistic interaction between meropenem and OA, reducing the MIC of meropenem to 4 µg/mL and OA to 32 µg/mL, while Res exhibited borderline synergy. Hemolysis assays indicated minimal erythrocyte toxicity (<5%) at concentrations up to 512 µg/mL. Fluorescence quenching studies qualitatively confirmed effective enzyme–inhibitor binding. Collectively, these findings demonstrate that OA acts as a promising phytochemical inhibitor of NDM-1, capable of restoring carbapenem activity and representing a potential lead compound for combating enzymatic antimicrobial resistance.

Keywords: Carbapenem resistance, Phytochemicals, Antibiotic synergy, Metallo-β-lactamase inhibition

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OP-HT5

A NATURAL ALGAE-DERIVED SOLUTION FOR SALTWATER-INDUCED SKIN STRESS

Kameshwaran S, Sai Ramesh A

Department of Bio-Engineering, School of Engineering,
Vels Institute of Science, Technology and Advanced Studies (VISTAS), Chennai, India.

Abstract

Skin damage, including tanning, oxidative stress, and barrier dysfunction, is exacerbated by prolonged exposure to sunlight and salty environments. Traditional sunscreens frequently contain artificial chemicals that are unsafe and environmentally harmful, underscoring the need for biocompatible and sustainable substitutes. Rich in naturally occurring bioactive substances like carotenoids, phlorotannins, polysaccharides, and mycosporine-like amino acids (MAAs), marine algae have become attractive options for skin health and photoprotection. In order to guarantee an environmentally friendly, economical, and high-yield recovery of active molecules, this study focuses on creating algal extracts made using green extraction techniques (aqueous, ethanol, and ultrasound-assisted methods). Using UV spectrophotometry, the extracts' in-vitro sun protection factor (SPF) was assessed to determine how well they could absorb and disperse dangerous UV radiation. In Additionally, to evaluate their contribution to reducing reactive oxygen species produced during photo-oxidative stress, antioxidant assays (DPPH, ABTS) were performed. The extracts were further tested for salt-stress shielding capacity, mimicking seawater-induced dryness and irritation in keratinocyte cell culture models to address a particular problem encountered in coastal environments. According to preliminary research, algal extracts have a dual protective effect by improving cell viability and hydration under saline stress conditions in addition to offering broad-spectrum UV absorption. This work is novel because it takes an integrated approach, using sustainable algal bioproducts to combine salt-stress defence and photoprotection in communities exposed to seawater. In line with the demand for safe and sustainable skincare products worldwide, this research provides a basis for creating topical formulations that are vegetarian-friendly and eco-friendly, like gels or sprays.

Keywords: Marine algae, Photoprotection, Green extraction, Antioxidant activity, Salt-stress shielding, Eco-friendly skincare

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OP-HT6

IDENTIFICATION OF THERAPEUTIC TARGETS FOR THE BREAST CANCER USING BIOACTIVE COMPOUNDS OF *Asparagus racemosus* THROUGH MOLECULAR DOCKING APPROACH.

T.S.Selvalakshmi, V.A.Santhosh and Dr.Divya G

Department of Biotechnology, SRM Arts and Science College, Chengalpattu – 603203
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Abstract:

Breast cancer is a disease where cells in the tissue of the breast, grow and divide abnormally at an uncontrollable rate. Breast cancer is the second major cause for death worldwide. *Asparagus racemosus*, a member of the Liliaceae family has been shown to have many properties to boost the immune system and solve the problems related to the female reproductive system. *Asparagus racemosus* comprises phytoestrogens which can be used for the treatment of breast cancer. The Phytoestrogens like kaempferol, racemosol, rutin extracted from *A. racemosus* are used as ligands and their activity is checked for human target molecules using AutoDock software by the process of the Molecular Docking. Molecular docking helps us in predicting the intermolecular framework formed between human protein and the ligand and suggests the binding modes responsible for inhibition of the protein. On the basis of the docking score, it can be predicted that certain compounds can inhibit the growth of breast cancer when injected in the human body. For that reason, our study proposes that *A. racemosus* could be used as a new source for the treatment of breast cancer.

Keywords: Breast cancer, *Asparagus racemosus*, Liliaceae family, Phytoestrogens, AutoDock, Molecular Docking.

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OP-HT7

COMPARATIVE PHYTOCHEMICAL AND BIOACTIVITY ANALYSIS *Euphorbia hirta* AND *Gymnema sylvestre* USING AQUEOUS EXTRACT

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Abstract

The therapeutic potential of medicinal plants is often constrained by the poor stability, limited bioavailability, and rapid degradation of their bioactive phyto constituents. *Euphorbia hirta* and *Gymnema sylvestre* are widely recognized for their antidiabetic, antioxidant, anti-inflammatory, and antimicrobial properties, however, their clinical and nutraceutical translation remains limited due to the aforementioned challenges. In the present study, a green and biocompatible nanoparticle-based delivery system was developed for the encapsulation of aqueous extracts of *Euphorbia hirta* and *Gymnema sylvestre* to enhance their physicochemical stability and biological efficacy. Aqueous extracts of both plant materials were prepared, combined, and subjected to nano particle synthesis using a suitable ionic cross-linking,polymeric encapsulation approach. The resulting nanoparticles were systematically characterized for particle size distribution, polydispersity index (PDI), zeta potential, surface morphology, and encapsulation efficiency. Fourier Transform Infrared Spectroscopy (FTIR) analysis was performed to confirm the successful incorporation of phyto constituents and to elucidate the interactions between the plant bioactives and the nanoparticle matrix. The in vitro release profile of the encapsulated formulation was also evaluated to assess controlled and sustained release behavior. The nano encapsulated formulation demonstrated a uniform nanoscale size range, acceptable colloidal stability, and high encapsulation efficiency. FTIR spectra confirmed the presence of characteristic functional groups of the plant extracts within the nanoparticle system, indicating successful encapsulation without chemical degradation. Compared to the crude aqueous extract, the nano formulation exhibited significantly enhanced antioxidant and antimicrobial activities, attributable to improved dispersion, increased surface area, and protection of labile phytochemicals from environmental degradation. The findings of this study suggest that nano particle encapsulation is an effective strategy for improving the delivery and therapeutic performance of plant derived bioactive compounds. The developed nano formulation of *Euphorbia hirta* and *Gymnema sylvestre* offers a promising, natural, and sustainable platform for future pharmaceutical and nutraceutical applications, particularly in the management of oxidative stress–related and microbial disorders.

Keywords: Nanoparticle encapsulation; *Euphorbia hirta; Gymnema sylvestre*; Phytochemicals; Antioxidant activity

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OP-HT8

EXPLORING MARINE SPONGE METABOLITES AS NEXT-GENERATION ANTICOAGULANT AGENTS

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Abstract:

Thrombotic and cardiovascular diseases continue to be major global health problems and are among the leading causes of morbidity and mortality. Anticoagulant therapy is essential for both the prevention and treatment of thromboembolic disorders. However, commonly used anticoagulants such as heparin, warfarin, and direct oral anticoagulants have several limitations. These drugs are often associated with adverse effects, particularly bleeding risks, drug–drug interactions, narrow therapeutic windows, safety concerns, and complications during long-term use. The problems related to existing anticoagulant treatments have opened up new anticoagulant agents manufacturing and marketing with improved efficacy and safety. Marine ecosystems represent a rich source of novel therapeutic compounds due to their vast biodiversity and chemical uniqueness. Marine sponges, especially, produce a wide variety of bioactive metabolites belonging to different chemical classes, including sulfated polysaccharides, alkaloids, terpenoids, steroids, peptides, and glycosaminoglycan-like compounds. These sponge-derived compounds exert their effects through multiple mechanisms, such as inhibition of key coagulation factors like thrombin and factor Xa, activation of antithrombin III, prevention of platelet aggregation, and disruption of fibrin clot formation. Experimental studies using in-vitro coagulation assays and in-vivo thrombosis models have confirmed their strong anticoagulant potential, often with fewer side effects compared to existing drugs. This review explores the potential of marine sponge metabolites as future anticoagulant agents, focusing on their chemical diversity, mechanisms of action, experimental evidence, and clinical prospects. It also highlights current challenges and emphasizes the importance of biotechnological advances and regulatory strategies to support the development of next-generation anticoagulant drugs from marine sponge resources.

Keywords: Marine sponges, Anticoagulant therapy, Bioactive metabolites, Thrombotic disorders, Sulfated polysaccharides, Drug discovery.

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OP-HT9

TINY PORES, BIG PROMISE: ZEOLITES AS ORAL TUMOR THERAPIES

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Abstract:

Zeolites are minerals with a tetrahedral crystalline structure formed by dense networks of AlO_4 and SiO_4 sharing oxygen atoms. These aluminosilicate networks create regularly distributed micro-pores, which can exchange water, ions, and polar molecules with the surrounding environment, giving zeolites unique ion exchange properties and absorption capacities. Absorption may occur on both the outer and inner surfaces of the material and are governed by the ability of molecules to fit into the micropores. These Zeolites can be effectively used to treat cancer by utilizing them as carrier materials for storage and targeted delivery of anti-cancer drug (doxorubicin (DOX), 5-fluorouracil (5-FU), curcumin, cisplatin, and miR-34a). Naturally occurring zeolite Clinoptilolite is the most widely used zeolite in various biomedical applications. ZIFs remain stable in water and aqueous NaOH, their framework quickly disintegrate in acidic solutions. This indicates that the pH sensitivity of ZIFs can aid in the development of ZIF-based drug-release platforms. Conveniently, cancer cells possess more acidic microenvironments compared with normal cells. This difference can be harnessed to achieve tumor-specific recognition and target treatment through anticancer drug-incorporated ZIF nanoplatforms and development of zeolite materials as oral formulations (pills).

Keywords: Zeolites, aluminosilicate, Clinoptilolite, tumor-specific recognition, anticancer drug-incorporated ZIF nanoplatforms, oral formulations (pills).

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OP-HT10

ADVANCEMENTS AND PROGRESSIONS FROM THE "GOLD STANDARD" TILL LATEST TECHNIQUES OF THE DNA SEQUENCING TECHNIQUES

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Abstract

The demand and urge to complete DNA sequencing to aid the molecular diagnostics with personalized medicine has been the greatest motive in the development of the sequencing techniques from the start till now. It all started with discovery of the double helical structure of DNA, first ever DNA sequencing started by the first complete nucleotide sequence of alanine tRNA from yeast then the sequence of the complete coat protein of RNA bacteriophage MS2. But the real outbreak was the Sanger's sequencing method for sequencing the DNA; it had a high accuracy rate of 99.99%, making this an important milestone in the developing technology of sequencing the genome. Thus, Sanger sequencing, also known as the "Gold standard", was the first generation in DNA sequencing techniques. Later came the second generation, also popularly called Next generation sequencing, had increased speed and reduced costs compared to the first generation. It included methods like Pyrosequencing, Sequencing by Reversible Terminator Chemistry, and Sequencing by Ligation. Then the third generation came into existence, that included methods like Single Molecule Fluorescent Sequencing, Single Molecule Real Time Sequencing, Semiconductor Sequencing, and Nanopore Sequencing. These were otherwise called long-read sequencing, and these enhanced the accuracy for applications in genetics, forensics, and microbial analysis. Finally comes the fourth generation sequencing which is the latest and is primarily driven by nanopore technology. It involves portable devices for rapid diagnosis with ultra-low cost, hence being the most advanced sequencing technique. While it excels in specific applications, it still is considered complementary for the previous "gold standard" rather than being a perfect replacement. And thus, this review focuses on the evolution of DNA sequencing techniques and their methods of achieving the latest standards.

Keywords: Sanger's sequencing, Next generation sequencing, Third generation sequencing, Fourth generation sequencing, Nanopore technology, Molecular diagnostics.

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OP-HT11

ANTIBIOTIC RESISTANCE: WHY MODERN MEDICINE IS AT RISK

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Abstract

Antibiotics are medicines that have saved millions of lives by treating bacterial infections. The proliferation of resistant bacteria threatens the safety of surgical procedures, cancer chemotherapy, and critical care worldwide. Over the last three decades, the unsound use of antibiotics has resulted in multi-resistant bacterial clones in hospitals and community environments. Prolonged illnesses, increased hospital stays, higher medical expenditures, and increased mortality are all part of the accompanying clinical impact. Antimicrobial resistance (AMR) caused about 1.27 million deaths in 2019. General contributory factors include self-medication, overuse, and inappropriate prescriptions of antimicrobials. Microorganisms develop antibiotic resistance through various mechanisms, such as antibiotic degradation, modifying target sites, reducing antibiotic permeability, and actively excluding antibiotics. Antibiotic resistance genes also play a significant role. To combat this global health threat, it is essential to use antibiotics responsibly, raise public awareness, and develop new treatments and alternatives.

Keywords: Resistant bacteria, Cancer chemotherapy,

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OP-HT12

PHYTOCHEMICAL ASSISTED ANTIDIABETIC AND ANTIOXIDANT ACTIVITIES FROM *Annona squamosA* LEAF EXTRACT BY USING GAS CHROMATOGRAPHY-MASS SPECTROSCOPY ANALYSIS

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Absract

Since ancient times, plant have been employed extensively in traditional medicine for their inherent therapeutic medicine. The multipurpose tree Annona squamosa, also referred to as the sugar apple or custard apple, is utilized in medicine. The qualitative phytochemical analysis of the extracts revealed the presence of alkaloids, flavonoids, saponins and phenolic substances. The distinct solvents, such as ethyl acetate and aqueous were used for the phytochemical analysis. These compounds were subjected to quantitative phytochemical analysis, which revealed that they had the greatest quantity of alkaloids is 0.917. As per usual protocol, GC-MS analysis was performed on Annona squamosa leaf extract. The seven compounds of Annona squamosa leaves were identified by GC-MS analysis. The main compound Dihydro-5-tetradecyl-2(3H)-furanone, was found to be 41.8% of the compounds,with a retention time of 18.97%. This compound has been reported to have a highest composition of the compounds followed by 14.28% of 3, 4-dimethyl-5oxo-2-5, dihydro-1H-pyrrol-2-yl) (4, 4-dimethyl-5 (2, 3, 3 trimethyl -5-methylthio-3, 4-dihydro- 2H-pyrrol- 2-ylmethylene) pyrrolidin-2ylene,thioacetic acid, S-(tert.-butyl) ester. The molecular weight of 16-Allopregnen, 3a, 7a, 11a-triol-20-one, triacetate compounds about approximately 3.3% and the retention time is 14.27, with the least contribution from the remaining compounds. The variety of bioactive compounds found in Annona squamosa, which is frequently consumed as food, suggested their potential for use in pharmacognosy and medication production. The maximum value of 41.56% for the leaf extract antioxidant activity in the DPPH scavenging assay using ethylacetate is comparable to 34.75% for the aqueous extract. The dried leaves of Annona squamosal have a powerful antioxidant, according to tested concentration: the extractwith the highest activity value was 100µg/ml showed the highest activity value of 41.56% in ethyl acetate extract indicating that the activity increases with concentration. This indicates a dose dependent relationship, with higher concentrations showing greater effectiveness and the lowest percentage of 34.37% compared to the aqueous extract of Annona squamosa leaves. This suggests that the dried custard apple leaves can oxidize DPPH free radical due to the presence phenolic and alkaloids in the custard apple leaves extract. Gallic acid is frequently used as a positive control to compare the results, and the percentage inhibition is calculated based on the absorbance difference between the control and sample in ethyl acetate. The assay has demonstrated potent DPPH scavenging free radicals at different concentration of 20, 40, 60, 80,

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and 100. Such that the plant could be useful in treating diabetics' free radical-mediated diseases.The alpha amylase inhibition assay was used to test the antidiabetic activity. The concentration of ethylacetate increased to 63.84% at 100µg/ml, while the aqueous extract value decreased to 58.85%. The absorbance difference between the control and sample in ethyl acetate, which has demonstrated strong alpha amylase activity at various concentration of 20, 40, 60, 80, and 100 is used to calculate the percentage inhibition. Acarbose is sometimes employed as a positive control to compare the results. Because of its rich phytochemistry, which includes substances like phenols, saponins, and alkaloids, the alpha amylase inhibition assay is in charge of converting complex carbohydrates (starch) into simple sugars like maltose and glucose. This is the first publication to use metabolic profile based on GC-MS to identify the different bioactive substances in ethylacetae extract of Annona squamosa. Its recommend the species for further study in drug discovery trials.

Keywords: *Annona squamosal* leaves, phytochemical, alkaloids, phenols, DPPH scavenging assay, Alpha amylase inhibitory activity, GC-MS analysis.

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OP-HT13

AN *IN SILICO* APPROACH FOR DISCOVERING POTENT ANTICANCER PHYTOCHEMICAL FROM *PHYLLANTHUS AMARUS* AGAINST ORAL SQUAMOUS CELL CARCINOMA"

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ABSTRACT

Oral squamous cell carcinoma (OSCC) is one of the most prevalent cancers of the head and neck region that remains as a major clinical challenge due to late diagnosis, aggressive metastasis, and resistance to conventional therapies. The pathogenesis of OSCC is significantly contributed by the dysregulation of Transforming growth factor-β1 (TGF-β1) that highlights the need for effective therapeutic alternatives. Plant derived compounds provide a promising multi target potential with potent therapeutic activity. In this study, leaves of *Phyllanthus amarus* were subjected to soxhlet extraction to obtain the crude extract that were further evaluated for total antioxidant potential, phytochemical composition and inhibitory activity against TGF-β1 using an integrated in silico drug discovery approach. The antioxidant capacity was assessed by phosphomolybdenum assay and GC MS analysis identified 47 phytochemical constituents in the crude extract. Virtual screening of these compounds were performed on these compounds against TGF-β1 using PyRx, followed by pharmacokinetic evaluation using SwissADME, and toxicity evaluation using ProTox-II, and STopTox. Three compounds with PubChem CIDs: 18274, 439507, and 3026 exhibited favorable drug likeness and safety profiles. Molecular docking indicated stable interactions of 3,8-dimethyl-2,7-dioxaspiro[4.4]nonane-1,6-dione, D-Allose, and Dibutyl phthalate with binding energies ranging from −3.98 to −5.66 kcal/mol. Among the three compounds, 3,8-dimethyl-2,7-dioxaspiro[4.4]nonane-1,6-dione with binding energy −5.66 kcal/mol is further studied by Molecular dynamics simulations for analysing stability of protein-ligand complex over the time period.

Keywords:
Oral squamous cell carcinoma, TGF-β1, *Phyllanthus amarus*, GC–MS, Molecular docking, Molecular dynamics.

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OP-HT14

NITROGEN STRESS-MEDIATED PRODUCTION OF BIOACTIVE COMPOUNDS FROM MICROALGAE FOR SUSTAINABLE AQUACULTURE DISINFECTANT DEVELOPMENT

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Abstract

Bacterial infections in aquaculture systems cause major losses to the economy and encourage the development of antimicrobial resistance. This research explores the production of bioactive compounds induced by nitrogen stress in the microalgal species *Chlorella, Spirulina*, and *Scenedesmus* for the potential use of sustainable aquaculture disinfectants. The microalgae were grown in nitrogen limited conditions. The biomass after the harvest was extracted and tested for phenolic content, carotenoids, antioxidant capacity, as well as antimicrobial activity against *Vibrio* and *E. coli*. Microalgae that have undergone nitrogen, stress release more phenolic compounds and carotenoids in a significant amount than the control. The extracts boast high antioxidant and antimicrobial properties, and nitrogen, limited cultures have the highest level of bioactive compound synthesis. This research demonstrated that by using nitrogen stress as a tool, microalgae production of bioactive metabolites can be greatly enhanced. Such bio-disinfectants are a greener alternative compared to chemical ones; plus, they help in reducing the development of antibiotic resistance and hardly pollute the environment of aquaculture ponds.

Keywords: Microalgae, Nitrogen Stress, Antimicrobial Activity, Aquaculture Disinfectant, Bioactive Compounds, Sustainable Aquaculture

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OP-HT15

BREAKING THE BIOFILM CODE: NATURAL ADJUVANTS TO RESTORE ANTIBIOTIC SENSITIVITY IN *Staphylococcus aureus*

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Abstract

Biofilm formation by *Staphylococcus aureus* creates dense, matrix-encased communities that are inherently tolerant to conventional antibiotics, posing a serious challenge to treatment and driving the spread of antimicrobial resistance (AMR). To address this, we are investigating a novel strategy that combines standard antibiotics (ampicillin and vancomycin) with a natural plant extract (green tea) to enhance biofilm disruption. Notably, green tea polyphenols (such as epigallocatechin gallate) have documented antimicrobial and anti-biofilm activities, suggesting they may sensitize biofilm-embedded bacteria to antibiotic action. Green tea is rich in catechins and considered safe for human use, making it an attractive and readily available adjuvant source. In our design, *S. aureus* biofilms will be cultivated in 96-well microplates and treated after maturation with either antibiotic alone or antibiotic plus green tea extract. Biofilm biomass will be stained with crystal violet and quantified by absorbance to compare control, antibiotic only, and combination treatments. All conditions will include replicates and appropriate controls for statistical rigor. This systematic approach allows assessment of potential synergy in reducing established biofilm mass and directly addresses the biofilm-mediated tolerance that is often missed by standard assays. We hypothesize that the antibiotic-green tea combination will significantly reduce biofilm biomass relative to antibiotic alone, indicating enhanced biofilm eradication. If successful, this work will highlight the potential of natural adjuvants to boost antibiotic efficacy against biofilm associated infections. This innovative strategy addresses pressing AMR challenges by repurposing dietary polyphenols as cost-effective adjuvants to conventional antibiotics, potentially improving treatment of chronic *S. aureus* infections and guiding the development of combined therapies against biofilm-mediated antibiotic tolerance.

Keywords: Biofilms, Antimicrobial resistance, Natural plant adjuvants, Antibiotic synergy, Crystalviolet assay.

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OP-HT16

EVALUATION OF FACTORS AFFECTING DISABILITY AMONG ANXIETY DISORDER PATIENTS USING REGRESSION ANALYSIS

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Abstract:

Background: Regression analysis is the most widely used statistical technique for prediction.the present study attempts to employ regression analysis to explore the factors affecting disability among anxiety disorder patients.

Objectives: To demonstrate applicability of regression analysis and to identify the predictors of disability using regression analysis.

Material and methods: Disability was measured using sheehan disability scale (sds) score.spss (15) was used for analyzing the data in the present study.data was collected as part of a research project in nimhans, bangalore that contained observations of 85 subjects and 24 variables was used for this study

Results: Mean age of sbjects was 27.47 year (sd = 6.312). Majority of the subjects were males (82.4 %).more than half of the subjects had the duration of illness more than 36 months (54.1 %). Majority of them were diagnosed as ocs (81.2%), only about 22 % of them had history of mental illness. Majority of the subjects had no physical illness history (85.9%).results indicated that family type, work and social adjustment (wsas) score and stress predicts disability (p= 0.005, p=0.001, and p=0.005 respectively). Disability score increased with increase in wsas score (b= 0.416) and stress (b=0.382).

Conclusion: Disability was highly correlated with quality of life, dysfunctional attitude scale, work and social adjustment scale, stress, anxiety and depression and depression anxiety stress scale total (dass).

Keywords: Disability, Anxiety disorder, Regression.

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OP-HT17

FORMULATION OF A BIOSURFACTANT BASED ANTIMICROBIAL SPRAY FOR FELINE PAW HYGIENE

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Abstract:

Biosurfactants are natural, eco-friendly surface-active molecules produced by microorganisms, offering advantages over synthetic surfactants due to their biodegradability, low toxicity, and multifunctional properties such as antimicrobial and biofilm-disrupting activity. In this study, soil samples were collected and isolates were first identified as Bacillus species through Gram staining, catalase reaction, and biochemical characterization. Four isolates were confirmed and subsequently screened for biosurfactant production using blood hemolysis, emulsification index, and oil-spreading assays. All four exhibited beta-hemolysis, high emulsification activity, and large oil-spreading diameters, indicating strong biosurfactant potential. These findings highlight the efficiency of Bacillus strains as biosurfactant producers and establish a foundation for their exploitation in sustainable biotechnology. While the present work focused on isolation, identification, and preliminary screening, future research will involve scaling up production, extraction, purification, and characterization, followed by application of these compounds as natural emulsifiers in food systems, biocontrol agents in agriculture, eco-friendly solutions for environmental clean-up, mild and biocompatible ingredients in cosmetics and pharmaceuticals, and safe antimicrobial formulations for veterinary hygiene.

Keywords: Biosurfactants, *Bacillus species*, Lipopeptides, Sustainable biotechnology

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OP-HT18

ISOLATION AND CHARACTERIZATION OF ANTIMICROBIAL COMPOUND FROM SOIL DERIVED *Streptomyces* AND ITS APPLICATION

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Abstract:
Actinomycetes are filamentous, Gram-positive bacteria that play a pivotal role in soil ecosystems due to their ability to synthesize diverse secondary metabolites. Among them, *Streptomyces* species are particularly significant, contributing the majority of known antimicrobial agents. These compounds, including polyketides, peptides, and glycosides, exhibit broad-spectrum activity against pathogenic fungi and bacteria, making them valuable in pharmaceutical development, agriculture, food preservation, and biotechnology. Their application as biopesticides provides eco-friendly alternatives to chemical pesticides, while their potential to enhance seed germination and plant vigor underscores their relevance in sustainable crop management. In the present study, soil-derived *Streptomyces* isolates were obtained and screened for antimicrobial activity with preliminary characterization confirming pathogen inhibition. Current work establishes the foundation for advanced investigations, with future research directed toward purification, structural elucidation and evaluation of these compounds in biopesticide formulations and agricultural productivity enhancement.

Keywords: Actinomycetes, *Streptomyces*, Antimicrobial compounds, Biopesticides, Seed germination.

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OP-HT19

NANOTOXICOLOGICAL EVALUATION OF SILICA NANOPARTICLES- A REVIEW

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Abstract:

Nanotechnology is a transformative field that has many uses in the areas of medicine, agriculture, electronics, and environmental science. Of the many different types of nanomaterials, silica nanoparticles (SiNPs) have received much attention due to their unique physico-chemical properties. Unlike other metallic nanoparticles, SiNPs are cost efficient, chemically and thermally stable, mesoporous, capable of controlled drug release, and suitable for targeted biomedical applications. This article will review the synthesis, characterization, biomedical applications and toxicological implications of SiNPs. Conventional methods for the synthesis of SiNPs include use of agricultural waste, industrial by-products, clay minerals, plants or microorganisms, and provide an environmentally sustainable, cost-effective approach for producing SiNPs. Characterisation of SiNPs, includes spectroscopy, electron microscopy, dynamic light scattering and x-ray diffraction, which can provide information about the morphology, crystallinity and surface chemistry of SiNPs. SiNPs have been shown to be useful in many areas of biomedicine, such as drugs, gene therapy, treatment of neurological disorders and diagnostics, such as fluorescence imaging, ultrasound and MRI enhancement. However, there are also numerous toxicological studies which show that SiNPs when used without the dose control can cause adverse effects to lung tissue. Further, many plant-derived compounds, such as anthocyanins from *Morus alba*, have shown promising results when combined with SiNPs in a synergistic manner. The utilisation of silica nanoparticles as an innovative delivery system for a wide variety of therapeutics in biomedical sciences is complemented by the combination of therapeutic effectiveness but developing and implementing sustainable synthesis pathways for silica nanoparticles is essential for utilising their full potential in this area.

Keywords: Biomedical applications, *Morus alba*, Nanotechnology, UV-vis spectrophotometry

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OP-HT20

ANTICANCER PROPERTY OF COLICIN DERIVED FROM *E. coli* AGAINST LIVER CANCER CELLS.

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Abstract:

Cancer remains a leading global cause of death, with incidence and mortality rates projected to rise by over 70% in the next two decades. Conventional treatments like surgery, radiation, and chemotherapy are widely used, but chemotherapy often harms healthy cells, causing severe side effects. To address these limitations, researchers are investigating bacteriocins that are positively charged antimicrobial peptides with selective cytotoxicity against cancer cells. Colicins, produced by *Escherichia coli*, are particularly promising bacteriocins due to their pore-forming mechanism involving three domains (T, R, and P). Colicin has demonstrated cytotoxicity against lung cancer cells, though its anticancer mechanism remains unclear. This study aims to isolate E. coli, produce and purify colicin, and testing against the human liver cancer cells to identify key domains, optimize activity, and explore therapeutic potential of colicin. Isolation of *E.coli* is done along with biochemical and molecular identification. Then centrifugation, filtration and chromatography techniques are performed to purify colicin. Presence of colicin is confirmed by SDS-PAGE, UV spectroscopy and PCR colicin-gene analysis. Thus, purified colicin is added with liver cancer cell lines. In-vivo experiments revealed significant tumor weight reduction and prolonged survival in mice treated with colicins, highlighting their potential as promising agents against cancers such as lymphosarcoma, breast and liver carcinoma, colon tumors. Hence, Colicins have various promising applications as targeted therapeutics, food preservatives, and laboratory tools. Their rapid kinetics, stability under diverse conditions, and low toxicity to humans make them safe alternative to antibiotics.

Keywords: Cancer, Colicin, *Escherichia coli*, Liver cancer cells, cytotoxicity, therapeutics.

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OP-HT21

FORMULATION AND EVALUATION OF ANTI–INFLAMMATORY TOOTHPASTE FROM ENDOPHYTIC BACTERIA ASSOCIATED WITH *Azadirachta indica* (NEEM PLANT)

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Abstract:

Oral diseases such as dental caries and periodontal disorders are mainly caused by microbial imbalance and poor oral hygiene. The growth of pathogenic microorganisms in the oral cavity leads to plaque formation and inflammatory responses, affecting both oral and overall health. Natural alternatives with antimicrobial and anti-inflammatory properties are therefore needed for effective oral care. *Azadirachta indica* (neem) harbors beneficial endophytic bacteria with bioactive potential. In this study, endophytic bacteria were isolated from neem leaves and screened for antimicrobial activity. The potent isolate was identified using 16S rRNA sequencing, and its bioactive compounds were extracted, partially characterized using chromatographic and spectroscopic methods, and tested for anti-inflammatory activity. Based on these properties, an anti-inflammatory toothpaste was formulated using the bacterial extract. The formulated toothpaste was tested for physicochemical properties, antimicrobial activity, stability, and anti-inflammatory potential. The results showed that the toothpaste had acceptable formulation characteristics along with effective antimicrobial and anti-inflammatory activity. This study highlights the potential of neem-derived endophytic bacteria as a natural source for developing safe and effective toothpaste for the management of oral diseases.

Keywords: Oral diseases, Endophytic bacteria, *Azadirachta indica*, Anti-inflammatory activity, Toothpaste formulation, Antimicrobial activity

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OP-HT22

NANOZYMES : ARTIFICIAL ENZYMES IN NANOTECHNOLOGY

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Abstract:

Nanozymes are nanomaterials that exhibit enzyme-like catalytic activities and have emerged as a promising alternative to natural enzymes in the field of nanotechnology. The purpose of this study is to highlight the development of nanozymes, address the limitations of conventional enzymes such as high cost, low stability, and sensitivity to environmental conditions, and emphasize how nanozymes fill this critical gap.

This abstract-based review summarizes the design principles, synthesis strategies, and catalytic mechanisms of commonly studied nanozymes, including metal, metal oxide, and carbon-based nanomaterials. Various analytical and characterization approaches used to evaluate their enzyme-mimicking activities are briefly discussed. Key findings indicate that nanozymes demonstrate high stability, tunable activity, cost-effectiveness, and ease of large-scale production compared to natural enzymes. Their applications span diverse areas such as biosensing, medical diagnostics, therapeutics, environmental remediation, and industrial catalysis.

The study concludes that nanozymes represent a significant advancement at the interface of nanotechnology and biochemistry, offering robust and versatile platforms for enzyme-related applications. Continued research on improving specificity and biocompatibility will further enhance their potential in biomedical and technological fields, making nanozymes a vital focus for future nanotechnology research.

Keywords: Nanozymes, Artificial Enzymes, Nanotechnology, Catalysis, Biomedical Applications, Biosensing.

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OP-HT23

EVALUATING HERBAL TOPICALS AS ALTERNATIVES FOR IMPETIGO MANAGEMENT

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Abstract:

Skin, the body's largest organ, serves as the primary barrier against physical, chemical pollutants, pathogens, and infections. The rising prevalence of Skin and Soft Tissue Infections (SSTIs), especially impetigo caused by *Staphylococcus aureus* and *Streptococcus pyogenes* in children aged 2-5 years, is increasingly complicated by antimicrobial resistance due to overuse of antibiotic. This study formulated an antibacterial cream using the synergistic action of *Ocimum basilicum* leaf and *Artabotrys hexapetalus* flower extracts. Ethanolic extracts showed superior zones of inhibition against both pathogens compared to other solvents. Phytochemical analysis, along with antibacterial, antioxidant, and anti-inflammatory assays, confirmed their efficacy. FTIR revealed functional groups like alkanes, nitro compounds, hydroxyls, and aromatics. The cream was formulated and evaluated for physicochemical properties, stability, and release profile, offering a promising natural alternative to combat resistant impetigo.

Keywords: *Ocimum basilicum* leaf, *Artabotrys hexapetalus* flower, Antibacterial cream, Synergistic effect, Natural alternative, Impetigo.

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OP-HT24

GREEN SYNTHESIS AND PHARMACOLOGICAL EVALUATION OF SILVER–ZINC OXIDE NANOCOMPOSITE FROM MACRO FUNGI – OYSTER MUSHROOM: A REVIEW

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Abstract:

Green synthesis of nanoparticles is a sustainable biological method that uses natural materials like plant extracts, microorganisms, algae, and fungi as eco-friendly agents for reduction and stabilization, thereby avoiding harmful chemicals and harsh reaction conditions. Nanoparticles derived from biomaterials have attracted significant interest because of their unique advantages, including low cost, simple synthesis procedures, high water solubility, and environmentally friendly characteristics. Nanoparticles derived from macro fungi, such as various mushroom species like Agaricus bisporus, Pleurotus spp., and Lentinus spp., are recognized for their notable nutritional value and biological activities, including immune modulation, antimicrobial effects, antioxidant, antidiabetic, and anticancer potential. Because fungi exhibit high wall-binding capacity, metal tolerance, and bioaccumulation, the synthesis process becomes easier. Extracellular molecules and proteins produced by fungal strains can serve as reducing and stabilizing agents during nanoparticle synthesis. Pleurotus spp.-derived silver-zinc oxide nanocomposites are known to inhibit many pathogenic organisms. Although no studies precisely match the specific research, existing research confirms the mycosynthesis of individual ZnO or Ag nanoparticles using macro fungi, including oyster mushrooms, and reports promising pharmacological properties such as antimicrobial, antioxidant, and anticancer activities. Characterization techniques employed include UV-Vis spectroscopy, FTIR, XRD, and SEM/EDX, which collectively confirm the nanoparticle size range. While no direct reports exist on an Ag-ZnO nanocomposite synthesized from oyster mushrooms and its pharmacological application, this review aims to provide a comprehensive summary of the advancements in the synthesis of nanocomposites derived from macro fungi and their diverse applications.

Keywords: Oyster mushroom, nanocomposite, characterization, antimicrobial, antioxidant, antidiabetic

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OP-HT25

PRODUCTION OF HYALURONIC ACID BY USING NATIVE STRAIN *Bacillus paralicheniformis* AND FORMULA TO MOISTURIZER

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Abstract:

Hyaluronic acid (HA) is a highly valued biomolecule in skincare due to its exceptional moisture-retention capacity and role in improving skin texture. In this study, a native strain of Bacillus paralicheniformis was investigated for the microbial production of HA as a sustainable alternative to animal-derived and synthetic sources. The strain was cultivated under controlled fermentation conditions, and the produced HA was purified to obtain cosmetic-grade quality. The purified biopolymer was subsequently formulated into a simple moisturizer intended to enhance skin hydration and softness. The formulated product was evaluated for physical stability and compatibility with the emulsion base and demonstrated good stability with no signs of phase separation or loss of functionality over time. Preliminary assessments indicated improved skin hydration without observable irritation, suggesting good skin tolerance. These findings highlight the potential of Bacillus paralicheniformis as an efficient and eco-friendly source of HA and support the application of bio-derived HA in sustainable cosmetic formulations. This approach offers a promising pathway toward environmentally responsible skincare products that align with growing consumer demand for natural and effective personal care solutions.

Keywords: Hyaluronic acid; Bacillus paralicheniformis; microbial fermentation; cosmetic formulation; sustainable skincare; bio-derived biomaterials

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OP-HT26

KENAF FIBER: PIONEERING GREEN WOUND DRESSINGS FOR TOMORROW

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Abstract

Skin serves as the first line of defence to protect the body against potentially harmful invading microorganisms . Without properly healing wounds, significant events such as disease processes, infections and even the possibility of death occur. The objective of this study is to investigate the capabilities of natural fibres that possess superior healing characteristics that mimic those of human skin while remaining environmentally friendly and biodegradable. Kenaf (*Hibiscus cannabinus L*) is an ideal candidate for this analysis due to its high availability and ability to absorb and retain moisture from its surroundings. Using various solvents, a series of extracts were made from the stems of *Hibiscus cannabinus*. The phytochemical composition of the extracts identified the presence of various bioactive constituents including terpenoids, alkaloids, flavonoids and phenolic compounds. The bioactive constituents found within the kenaf plant have the ability to protect against the onset of disease and to confer numerous potential health benefits including antibacterial and antioxidant activity. Fourier Transform Infrared Spectroscopy (FTIR) revealed the constituents and respective functional groups associated with the extract, including alkenes and amide groups. The antibacterial activity of the stem extracts was determined using the agar well diffusion method against skin pathogenic microorganisms. When compared to other species including *K. pneumoniae, P. vulgaris, P. aeruginosa*, and *B. subtilis, E. coli* and *S. aureus* shown notable antibacterial activity. Additionally, anti-fungal effectiveness against *Candida albicans* and *Aspergillus flavus* was noted. By restricting the conditions that are conducive to bacterial growth, air passing through the kenaf fibre can inhibit the growth of bacteria. The investigation consistently demonstrates that Kenaf (*Hibiscus cannabinus L*) absorbs the wound exudate very well and thus reduces the possibility of causing maceration and creates a drier wound environment, which is critical for optimal wound healing.

Keywords: Biodegradable, natural fiber, antibacterial activity, wound healing.

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OP-HT27

SCREENING OF BIOACTIVE COMPOUNDS FROM MICROALGAE FOR ANTIDIABETIC ACTIVITY

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Abstract

Diabetes mellitus is a chronic metabolic disorder posing a significant global health challenge, with Type 2 diabetes accounting for more than 85% of total cases. The disease is associated with severe complications including cardiovascular disorders, nephropathy, neuropathy, and retinopathy. Although synthetic antidiabetic drugs are widely prescribed, their prolonged use is often linked with adverse side effects, necessitating the exploration of safer and more sustainable alternatives. In this context, microalgae have gained increasing attention as a potential source of natural antidiabetic compounds. Microalgae are rich in diverse bioactive metabolites such as flavonoids, phenolic compounds, pigments, polysaccharides, and polyunsaturated fatty acids, many of which exhibit strong antioxidant and antidiabetic properties. This review summarizes existing literature on the antidiabetic potential of microalgal bioactive compounds, with emphasis on their mechanisms of action. Several studies report that microalgal extracts effectively inhibit key carbohydrate digesting enzymes, including α-amylase and α-glucosidase, thereby reducing postprandial glucose levels. Additionally, these metabolites contribute to improved insulin sensitivity, regulation of glucose metabolism, and attenuation of oxidative stress, which plays a crucial role in the progression of diabetic complications. The findings discussed in this review highlight microalgae as a promising and sustainable source of natural antidiabetic agents. However, further in vitro, in vivo, and clinical investigations are required to isolate active constituents, establish safety profiles, and validate their efficacy. The incorporation of microalgal bioactive into functional foods and pharmaceutical formulations may offer novel strategies for diabetes management and prevention.

Keywords: Microalgae; Antidiabetic activity; α-amylase inhibition; α-glucosidase inhibition; Antioxidant activity

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OP-HT28

DEVELOPMENT OF AN ALGAL–BACTERIAL OXYGEN-RELEASING HYDROGEL FOR ENHANCED DIABETIC WOUND HEALING

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Abstract:

Chronic diabetic wounds are characterized by poor vascularization, hypoxia, and high susceptibility to infection, which significantly delay the wound healing process. Conventional wound dressings often fail to provide adequate oxygenation and infection control at the wound site. The present study was designed to develop an algal–bacterial oxygen-releasing hydrogel as a wound dressing material for diabetic wound management. Photosynthetic microalgae such as *Chlorella* species, is used as a natural source of oxygen and antioxidants, while *Bacillus subtilis* lysate is incorporated for its antimicrobial and anti-inflammatory properties. The hydrogel matrix, prepared using biocompatible polymer materials, is designed to ensure moisture retention, nutrient diffusion, and controlled oxygen release. The prepared hydrogel was evaluated for its physical characteristics such as gelation time, swelling behavior, and stability. Biological studies were carried out to assess oxygen release, antioxidant activity, antibacterial effect, and cytocompatibility. Preliminary observations indicate that the hydrogel exhibits controlled oxygen release, good antioxidant potential, and significant antibacterial activity while maintaining biocompatibility. The combined action of oxygen supplementation, infection control, and antioxidant protection is expected to create a favorable wound environment and promote faster healing. This study suggests that the algal–bacterial oxygen-releasing hydrogel has good potential as an effective wound dressing material for the treatment of diabetic foot ulcers.

Keywords: Diabetic foot ulcer, Oxygen-releasing hydrogel, *Chlorella*, *Bacillus subtilis*, Wound healing, Biomaterials.

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OP-HT29

EXTRACTION AND EVALUATION OF SUNSCREEN FORMULATION USING HERBAL PLANTS

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Abstract:

The development of herbal-based sunscreen formulations has gained significant attention due to the increasing demand for safe, eco-friendly, and skin-compatible cosmetic products. Plant-derived extracts are rich in natural antioxidants and UV-absorbing compounds, making them effective alternatives to synthetic sunscreen agents. The sunscreen formulation include using herbal plants such as beetroot (Beta vulgaris), green tea (Camellia sinensis), and flaxseed (Linum usitatissimum). The plant materials were extracted using cold maceration,to obtain bioactive compounds such as betalains, polyphenols, and lignans. The extracts were analysed using spectrophotometric methods for phytochemical screening and quantification. The in vitro sun protection factor (SPF) were found to be 15.3 . This study aims to highlight the potential of herbal plant extract to be used in sunscreen formulation, with future application in the cosmetic industry

Keywords: Herbal sunscreen, Plant extracts, Phytochemical analysis, In vitro SPF, Antioxidant activity, Natural UV filters.

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OP-HT30

DEVELOPMENT AND EVALUATION OF ALTERNATIVE METHOD FOR SECONDARY SCREENING OF ANTIBIOTIC- PRODUCING ACTINOMYCETES STRAINS

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Abstract:

Actinomycetes are filamentous, Gram-positive bacteria that are well known for their capacity to generate a wide variety of bioactive secondary metabolites, especially antibiotics. The necessity for effective and trustworthy screening techniques to find strong antibiotic-producing bacteria has arisen due to the growing prevalence of antibiotic resistance. The invention and assessment of a different technique for secondary screening of actinomycetes that produce antibiotics and are isolated from saline environments is the main goal of the current work.

Using morphological, biochemical, and molecular methods, actinomycete strains were obtained from a variety of salty sources. To find potential isolates, primary screening for antibiotic production was done. Actinomycete cultures grown on Mueller-Hinton agar were covered with soft agar infected with test bacterial pathogens and incubated under suitable conditions as part of an alternate overlay procedure used for secondary screening.The inhibition zones generated against the test organisms were used to assess the antibacterial activity. To evaluate efficiency and dependability, the new method's results were contrasted with traditional secondary screening methods. High Performance Liquid Chromatography (HPLC) and other analytical techniques were used to further analyze the bioactive metabolites.

The study shows that the suggested alternative secondary screening method is efficient, quick, and appropriate for first assessment of antimicrobial activity. It also emphasizes the potential of saline-derived actinomycetes as a source of antibiotic compounds. This method could help develop better screening techniques for antibiotic discovery initiatives.

Keywords: actinomycetes, primary screening, secondary screening

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OP-HT31

STUDY ON MOLECULAR DETECTION OF THE mecA GENE IN MRSA AND ITS ANTIMICROBIAL SUSCEPTIBILITY PATTERN

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Abstract:

Methicillin Resistant Staphylococcus aureus (MRSA) is a common bacterial pathogen that causes different types of infections in humans. Due to increasing antibiotic resistance, especially to methicillin and related drugs, the treatment of Staphylococcus aureus infections has become more challenging. The present study is aimed at the molecular detection of the mecA gene from MRSA isolates and the study of their antibiogram profile.

Clinical samples suspected of Staphylococcus aureus infection were collected and processed using standard microbiological methods for isolation and identification. Antibiotic susceptibility testing was carried out by the Kirby–Bauer disc diffusion method following CLSI guidelines to determine the resistance pattern of the isolates. Molecular identification of MRSA was done by polymerase chain reaction (PCR) targeting the mecA gene, which is responsible for methicillin resistance.

This study shows the importance of using both conventional laboratory methods and molecular techniques for the proper identification of MRSA. The antibiogram profile helps in understanding the antibiotic resistance pattern of the isolates and can support the selection of suitable antibiotics for treatment. Overall, this study emphasizes the need for regular monitoring of MRSA and its resistance pattern to improve infection control and patient management in clinical laboratories.

Keywords: MRSA; Staphylococcus aureus; mecA gene; Antibiogram; Antibiotic resistance.

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OP-HT32

KNOWLEDGE, ATTITUDES, AND PRACTICES (KAP) REGARDING SNAKEBITE AND CHARACTERIZATION OF BACTERIAL ORAL FLORA OF COMMON KRAIT (*Bungarus caeruleus*) IN RURAL TAMIL NADU

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Abstract:

Snakebite envenoming is the leading public health problem in rural South Asia that flies under the radar, resulting in an estimated death toll of 27, 00050, 000 annually only in India. Among the snake species, the common krait *(Bungarus caeruleus*) is one of the major contributors to this burden and is the main cause of elapid, related deaths in Tamil Nadu. Apart from the effects of venom, nearly 3050% of snakebite cases are complicated by secondary bacterial infections that originate from the snakes oral flora, and which can very significantly worsen clinical outcomes. However, on the other hand, a large number of victims in rural areas still depend on various harmful traditional first aid methods like a tight tourniquet and wound incisions that cause tissue damage and, thus, infection risk is further increased. Notwithstanding this, in rural Tamil Nadu, there is no integrated work that marries village, level behavioural study with microbiological characterisation. A cross, sectional KAP survey will be conducted among 150 members of rural communities and 75 healthcare providers from the Madurai district. Structured, validated questionnaires will be used for snakebite awareness, first aid, and treatment, seeking behaviour. Under ethical approval, oral swabs will be taken from captive common kraits (Liana Trust, Mysuru). Standard culture media like Blood Agar and MacConkey Agar will be used to obtain bacterial isolates, which will be identified by both conventional biochemical tests and MALDI, TOF mass spectrometry and tested for antibiotic susceptibility following CLSI guidelines The research should uncover the existing misunderstandings, lack of knowledge, and unsafe practices that aggravate the poor outcomes of snakebites in rural areas. It is expected that the laboratory tests will identify the chief bacterial pathogens, including multi, drug resistant strains, of krait oral flora and secondary wound infections. Thus, these findings will be instrumental in aiding the formulation of targeted community awareness programs, educating healthcare providers efficiently, and developing rational antibiotic regimens to treat and prevent secondary infections, thereby also facilitating greater synergy with the National Action Plan for Snakebite Envenoming (NAPSE) and reducing snakebite mortality in South India.

Keywords: *Bungarus caeruleus*, knowledge–attitudes–practices survey, oral microflora, antibiotic resistance, secondary infections, rural health, Tamil Nadu.

We do not inherit the Earth from our ancestors; we borrow it from our children. - American Proverb

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OP-HT33

BIOLOGICAL SYNTHESIS OF SILVER NANOPARTICLE AND ITS ACTIVITY AGAINST MDR MICROORGANISMS AND APPLICATION IN DENTAL RESTORATIVE MATERIAL

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Abstract

The increase of multidrug-resistant (MDR) bacteria, such as Gram-positive (e.g., *S. aureus*, *E. faecium*) and Gram-negative (e.g., *E. coli*, *K. pneumoniae, P. aeruginosa*) pathogens, has put the whole field of medicine in a crisis. The main pathogens behind chronic infections like bloodstream infections, pneumonia, and UTIs are these resistant bacterial strains. The consequences are an increase in mortality, longer hospital stays, and higher economic costs, especially in the case of low-resource settings. The resistance mechanisms of the bacteria, such as decreased permeability, efflux systems, enzymatic destruction, target alteration and gene transfer, make the traditional antibiotics ineffective. The utilization of nanotechnology, more specifically silver nanoparticles (AgNPs), presented a new approach. AgNPs have extensive antimicrobial effects, such as causing the leakage of cellular contents, producing reactive oxygen species (ROS), damaging proteins, inhibiting DNA synthesis, and inhibiting biofilms. Through this resistance, development is minimized. Synergistic combinations of antibiotics and AgNPs, defined by the Fractional Inhibitory Concentration Index (FICI), can result in increased permeability, reduced rate of degradation, and lower antibiotic doses. *Clitoria ternatea* (blue pea), which is rich in flavonoids and anthocyanins, can be used for the biological synthesis of silver nanoparticles. The antimicrobial activity of the synthesised AgNPs was studied against oral and general pathogens. Dental restorations (amalgam, composites, glass ionomers) are susceptible to MDR biofilm formation, which in turn contributes to secondary caries and restoration failure. Performing an infusion of biological synthesised AgNPs into these materials can lead to a prolonged antibacterial effect, bacterial biofilm inhibition, and a fight against MDR oral pathogens, which can thus help in the achievement of restoration longevity and oral health improvement.

Keywords: *Clitoria ternatea,* silver nanoparticle, multidrug-resistant (MDR) bacteria, Synergistic effect, Dental restorative material.

BIOLOGICALS & BIOSYNTHESIS

(OP-B1 – OP-B23)

Craig Venter once said, we're not just reading the genetic code—we're writing it.

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OP-B1

BIOSYNTHESIZED MAGNESIUM OXIDE NANOPARTICLES FROM *Sargassum wightii*: PHYTOTOXICITY ASSESSMENT AND DEVELOPMENT OF A MOSQUITO REPELLENT FORMULATION AGAINST *Aedes aegypti*

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Abstract:

The present study focuses on the biogenic synthesis of magnesium oxide nanoparticles (MgO NPs) using the brown marine alga *Sargassum wightii* as an eco-friendly and sustainable reducing and stabilizing agent. Marine algae are rich sources of bioactive phytochemicals, which play a crucial role in nanoparticle formation and biological activity. Initially, the phytochemical constituents of the aqueous extract of *Sargassum wightii* were analyzed to identify the functional biomolecules involved in the green synthesis process. The synthesized magnesium oxide nanoparticles were systematically characterized using UV–Visible spectroscopy, Fourier Transform Infrared (FT-IR) spectroscopy, X-ray Diffraction (XRD), Scanning Electron Microscopy coupled with Energy Dispersive X-ray Analysis (SEM-EDAX), and Zeta potential analysis to confirm nanoparticle formation, crystalline nature, surface morphology, elemental composition, and stability. Furthermore, the antimicrobial efficacy of the biosynthesized MgO nanoparticles and the aqueous extract of *Sargassum wightii* was evaluated against selected pathogenic microorganisms using the agar well diffusion method. In addition, the mosquito repellent activity of *Sargassum wightii* extracts was assessed against *Aedes aegypti*, the vector responsible for dengue fever. The outcomes of this study highlight the potential of *Sargassum wightii*-mediated magnesium oxide nanoparticles as effective antimicrobial and mosquito repellent agents, emphasizing their applicability in biomedical and vector control strategies while promoting green nanotechnology approaches.

Keywords:

Green synthesis; Magnesium oxide nanoparticles; *Sargassum wightii*; Phytochemical analysis; Antimicrobial activity; Mosquito repellent activity; *Aedes aegypti*; Marine algae

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OP-B2

BIOSYNTHESIZED BISMUTH NANOPARTICLES FROM *Solanum torvum*: PHYTOCHEMICAL CHARACTERIZATION, ANTIOXIDANT POTENTIAL, ANTIMICROBIAL ACTIVITY, AND DYE DEGRADATION

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Abstract:

The present investigation aims to explore a sustainable and eco-friendly biogenic approach for the synthesis of bismuth nanoparticles (Bi NPs) using the aqueous fruit extract of *Solanum torvum*. Plant-mediated synthesis of nanoparticles has gained significant attention due to its cost-effectiveness, biocompatibility, and minimal environmental impact. Initially, the aqueous fruit extract of *Solanum torvum* was subjected to phytochemical screening to identify the bioactive constituents responsible for the reduction and stabilization of bismuth ions. The antioxidant potential of the fruit extract was evaluated through DPPH free radical scavenging activity, hydrogen peroxide scavenging assay, and reducing power assay, highlighting its redox capability. The successful formation of biogenic bismuth nanoparticles was confirmed and characterized using UV–Visible spectroscopy, Fourier Transform Infrared (FT-IR) spectroscopy, X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM) coupled with Energy Dispersive X-ray Analysis (SEM-EDAX), and Zeta potential analysis to determine their optical properties, functional groups, crystalline nature, surface morphology, elemental composition, and stability. Furthermore, the antimicrobial efficacy of the biosynthesized bismuth nanoparticles and the aqueous fruit extract of *Solanum torvum* was assessed against selected pathogenic microorganisms using the agar well diffusion method. In addition, the dye degradation activity of *Solanum torvum* fruit extract was evaluated to explore its potential in environmental remediation applications. The findings of this study demonstrate that *Solanum torvum*-mediated bismuth nanoparticles possess significant antioxidant, antimicrobial, and dye degradation activities, emphasizing their promising applications in biomedical and environmental fields through green nanotechnology.

Keywords:

Biogenic synthesis; Bismuth nanoparticles; *Solanum torvum*; Phytochemical analysis; Antioxidant activity; Antimicrobial activity; Dye degradation; Green nanotechnology.

Societal collapse often follows environmental collapse. – Jared Diamond

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OP-B3

SOL–GEL AND ELECTROSPINNING APPROACHES FOR CELLULOSE ACETATE–CURCUMIN WOUND DRESSING MATERIALS

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Abstract:

Cellulose acetate–curcumin nanocomposites and nanofibrous membranes were prepared using sol–gel and electrospinning methods for potential wound healing applications. Curcumin is a well-known bioactive compound, but its poor stability and low dispersion limit its direct use in biomedical materials. In this work, cellulose acetate was used as a biocompatible polymer to improve curcumin incorporation. The prepared materials were characterized using scanning electron microscopy (SEM) and Fourier transform infrared spectroscopy (FTIR). SEM results showed that the sol–gel method produced compact nanocomposite structures, while electrospinning resulted in uniform, continuous nanofibrous membranes with high surface area. FTIR analysis confirmed the presence of curcumin within the cellulose acetate matrix and indicated interactions between the polymer and curcumin functional groups. The study demonstrates that the fabrication method strongly influences material structure. In particular, the electrospun cellulose acetate–curcumin membrane appears promising for wound dressing applications due to its fibrous morphology and biocompatible nature.

Keywords: Cellulose acetate, Curcumin, Sol–gel method, Electrospinning, Nanocomposite, Nanofibrous membrane

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OP-B4

NANOLIPOSOMES MEDIATED ESSENTIAL OIL CORE-SHELL FORMATION

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Abstract:

This project focuses on the development of nanoliposome-mediated core–shell systems for the effective encapsulation of essential oils using biopolymer-based green synthesis approaches. Nanoliposomes, owing to their lipid bilayer structure, enhance the stability, bioavailability, and controlled release of bioactive compounds. In this study, herbal extracts such as black seed oil and carom seed extract were incorporated into chitosan, sodium alginate, and starch matrices to form biofilms and nanoparticle systems. The synthesized nanoparticles were characterized using standard techniques, and their antimicrobial efficacy was evaluated against bacterial strains. Among the biopolymers studied, chitosan-based biofilms exhibited superior film-forming ability and significant antimicrobial activity. The results highlight the potential of nanoliposome-assisted essential oil encapsulation as an eco-friendly and effective strategy for applications in drug delivery, biomedical coatings, and food packaging.

Keywords: Nanoliposomes, Essential oil encapsulation, Biopolymer biofilms, Chitosan nanoparticles, Antimicrobial activity, Green synthesis

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OP-B5

PRODUCTION OF SQUALENE FROM *Saccharomyces cerevisae* IN COSMTICS

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Abstract:

Squalene is a natural triterpene hydrocarbon ($C_{30}H_{50}$) widely used in cosmetics, pharmaceuticals, and nutraceuticals due to its antioxidant, moisturizing and skin-repairing properties. In pharmaceuticals as a drug carrier and vaccine adjuvant and in nutraceuticals for its potential health benefits, including cholesterol regulation and immune modulation. Traditionally extracted from shark liver oil, squalene production from animal sources raises environmental and ethical concerns highlighting the need for sustainable alternatives. Plant sources like olive oil, amaranth seed, and rice bran have squalene but they produce small amounts and extracting it takes a lot of resources. In this study Saccharomyces cerevisiae (baker's yeast) was used as a microbial source for squalene extraction through a cost-effective and eco-friendly process. Squalene comes from yeast because it provides a sustainable, ethical and effective alternative to traditional animal sources. Unlike extracting squalene from shark liver oil, using yeast does not harm marine ecosystems. Saccharomyces cerevisiae naturally produces squalene as part of the sterol biosynthesis pathway making it a dependable microbial source. Cultivating yeast is cost-effective, scalable, and easy to manage in laboratory and industrial fermentation settings. It exhibits strong antioxidant activity, protecting cells from oxidative stress by scavenging free radicals and plays a key role in skin hydration and repair making it a valuable ingredient in cosmetic formulations. In humans, squalene is a natural component of sebum contributing to skin elasticity and barrier function. Thus S. cerevisiae can serve as a reliable, renewable and ethical source for squalene production. The method developed is simple, reproducible and suitable for laboratory-scale extraction, requiring minimal equipment and reagents. The approach offers potential for upscaling to industrial levels for cosmetic and pharmaceutical applications. Further analysis using HPLC or GC–MS and Thin Layer Chromatography (TLC) can be performed to confirm purity and molecular identity, ensuring quality for commercial use. Overall, this work provides a sustainable biotechnological strategy for producing squalene that aligns with green chemistry and ethical sourcing principles.

Keywords: *Saccharomyces cerevisiae,* Squalene, Solvent extraction, HPLC, GC-MS, Sustainable production, UV–Visible spectrophotometer.

Small changes in systems can create large impacts. – Donella Meadows

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OP-B6

EXTRACTION AND EVALUATION OF POLYHYDROXY BUTYRATE (PHB) FROM ISOLATED ORGANISMS USING CHEMICAL AND ULTARSOUND ASSISTED METHODS AND MOLECULAR CHARACTERIZATION OF PHB PRODUCERS.

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Abstract:

The production of biodegradable polymers gains significant attention in terms of sustainability and Eco-friendly alternatives. Polyhydroxybutyrate (PHB) is one such biopolymer that has garnered considerable attention as a biodegradable plastic as it offers an environmentally friendly alternative to conventional plastics. Microbial synthesis of PHB gains significant attention as it is found in the stockpile of numerous bacteria. This biopolymer and its components can be naturally degraded in the environment serves as a great substitute for the conventional petrochemical plastics. This study was conducted with the objective of identifying, isolating, characterizing, and evaluating potential PHB-producing bacteria from oil-spilled soil samples collected at an industrial hub located in Ennore, Chennai. A total of 314 colonies were obtained through serial dilution and culturing. Distinct organisms were isolated from the mother plate inducing to different screening techniques, including Sudan black B, Nile red, and Nile blue staining were utilized resulting in the isolation of six positive strains LSE1, LSE2, LSE3, LSE4, LSE5, LSE6. Among these, LSE4 exhibited the highest production of PHB, accounting for 63% of PHB from dry cell weight, followed by LSE 5 at 61% of PHB from dry cell weight. The identification of LSE 4 and LSE 5 strains involved various microbiological staining techniques and differential plating methods, including simple staining, Gram's staining, and MacConkey Agar resulting one strain as gram positive, other gram negative as shown negative results in MacConkey Agar. The polymer produced was subjected to FTIR analysis upon which it was confirmed to indeed be PHB. Furthermore, Evaluation of chemical assisted and Ultrasound assisted techniques were conducted to identify the effectiveness of PHB production. As a result, The chemical assisted technique of extraction shown much effectiveness in the production of PHB than Ultrasound assisted technique. Characterisation of best PHB producing strain was done inducing genetic engineering technique of 16s rRNA sequencing identifying the bacterial species.

Keywords: Biodegradable polymer, Chemical extraction, Differential staining, FTIR, MacConkey Agar, Oil spilled, Polyhydroxybutyrate (PHB), Ultrasound assisted extraction

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OP-B7

EVALUATION AND CHARACTERIZATION OF PROBIOTIC ATTRIBUTES AND ADHERENCE POTENTIAL OF NOVEL BACTERIAL STRAINS FROM INFANTS OF SOUTH INDIA

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Abstract:

The objective of this research is to isolate, characterise, and assess the probiotic potential of probiotic strains from the faecal samples of infants from the South Indian population. The probiotic microorganisms that were identified from five infants born in south India are the subject of this invention. Infant faecal samples were collected, serially diluted, and screened on MRS agar plates. The Lactobacillus sp. was evaluated for bile and acid tolerance since they should colonise in the colon and gastrointestinal system in order to validate the chosen probiotic strains. The isolated bacterial strains C1, C3, C5, C9, and C10 were the most resistant to acid (90.06%) and bile salt (73.8%). The strains C4, C6, and C7 were the least resistant. Since isolated microorganisms might colonise in the colon and GI tract, they were tested for bile and acid tolerance. The aforementioned microbe can be utilised in the pharmaceutical sector as a source of microbial flora, which is thought to be an effective probiotic moderator for ulcer treatment. Cultures of presumed gram-positive Lactobacillus sp. are the isolated bacterium.

Keywords: Infants, Probiotic strains, Lactobacillus, Antibiotic activity.

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OP-B8

BIOENGINEERED MUSSEL ADHESIVE PROTEINS: SCALABLE PRODUCTION AND THERAPEUTIC POTENTIAL IN WOUND CARE

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Abstract:

Harnessing the unparalleled adhesion mechanism of marine mussels offers a critical route toward solving the persistent limitations of conventional medical adhesives in wet, biological environments. Current medical adhesives frequently fail in complex biological environments, necessitating the development of novel materials inspired by nature's best solutions. This study focuses on engineering a high-performance adhesive protein based on Mussel Adhesive Proteins (MAPs), whose superior underwater bonding. The primary aim was to optimize the large-scale production and purification of a MAP. The recombinant MAP gene was successfully cloned into the pQE-80L vector and transformed into an E. coli host. A stepwise optimization and production of MAP leading to the successful expression and purification of the homogeneous MAP protein, confirmed via SDS-PAGE. The purified MAP underwent comprehensive characterization, including Circular Dichroism, Turbidity Analysis to confirm its structural integrity and functional potential for coacervation. Furthermore, the protein's therapeutic application was investigated through an in vitro wound healing study on specific cell lines to assess its ability to accelerate cell migration. The successful production of MAP at scale and its promising in vitro activity demonstrate a novel, bioengineered material with tuneable properties. This work advances the understanding of structure-function relationships in biological adhesives and offers a strong foundation for developing biocompatible and therapeutic tissue repair agents.

Keywords: Mussel Adhesive Protein, Optimization, Production, Characterization, Wound healing.

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OP-B9

RECOMBINANT COLLAGEN-MIMETIC BIOMATERIALS FOR WOUND HEALING

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Abstract:

Wound healing is a highly coordinated biological process that relies on effective extracellular matrix remodelling and angiogenesis to restore tissue integrity. It requires biomaterials that combine structural support, self-assembly, and biological functionality. Collagen-based materials are extensively employed in wound care due to their biocompatibility and extracellular matrix (ECM) organisation. However, the clinical use of animal-derived collagen is limited by concerns related to immunogenicity, pathogen transmission, ethical constraints, and batch-to-batch variability. These limitations necessitate the development of reproducible and safer alternatives. In this study, Bacterial collagen produced through recombinant expression systems represents a robust alternative to animal-derived collagen, offering scalability, biosafety, and precise molecular control. Recombinant collagen-like proteins (CLPs) closely mimic the structural attributes of native collagen while allowing programmable sequence design. The engineered CLPs adopt a stable triple-helical conformation and self-assemble into higher-order architectures suitable for biomaterial fabrication. To further enhance material performance, CLPs were incorporated with 3,4-dihydroxyphenylalanine (DOPA) through the genetic code expansion technique. This functionalization strategy strengthens the intra- and intermolecular interactions, improves structural stability, and enables efficient growth factor immobilization. DOPA-mediated chemistry facilitates vascular endothelial growth factor (VEGF) conjugation, integrating angiogenic functionality within the material framework. Thus, the study develops a CLP-based biomaterial for biomedical applications.

Keywords: Wound healing, Extracellular matrix, Collagen-like Protein, 3,4-dihydroxyphenylalanine, Biomaterial, Biomedical application.

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OP-B10

INTEGRATED EVALUATION OF GREEN-SYNTHESIZED ZINC NANOPARTICLES IN BLACK GRAM (*Vigna mungo*): CHARACTERIZATION, SOIL IMPACT, GROWTH ENHANCEMENT, AND MOLECULAR DOCKING INSIGHTS

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Abstract:

Green synthesis of nanoparticles has gained significant attention as an eco-friendly alternative to conventional chemical methods, particularly for agricultural applications. In the present study, green-synthesized zinc nanoparticles (ZnNPs) were evaluated through an integrated experimental approach to assess their physicochemical characteristics, antimicrobial activity, influence on soil parameters, effect on seedling emergence, and molecular-level interactions related to growth enhancement in black gram (Vigna mungo). Zinc nanoparticles were synthesized using aqueous extract of Piper betle leaves, where plant phytochemicals acted as natural reducing and stabilizing agents. Formation of ZnNPs was confirmed through UV–Visible spectroscopy, while FTIR analysis revealed the involvement of functional groups responsible for nanoparticle stabilization. The synthesized nanoparticles exhibited effective antimicrobial activity against both Gram-positive and Gram-negative bacterial strains, indicating their strong bactericidal potential. Soil-based experiments demonstrated that ZnNP application improved soil nutrient availability, particularly nitrogen, phosphorus, and potassium, without causing significant changes in soil pH. Seedling emergence studies showed earlier germination, increased plant length, and enhanced seedling vigor in ZnNP-treated soil compared to untreated control. To understand the possible molecular mechanism behind growth enhancement, molecular docking analysis was performed between ZnNPs and growth-related proteins such as Auxin-Binding Protein 1 (ABP1) and Zinc Finger proteins. The docking results revealed stronger binding affinity with Zinc Finger proteins, suggesting a role in transcriptional regulation and growth stimulation. Overall, the experimental findings indicate that green-synthesized zinc nanoparticles act as a multifunctional nano-agent capable of improving soil quality, enhancing early plant growth, and interacting with key growth-regulating proteins, highlighting their potential application in sustainable agriculture.

Keywords: Green synthesis, Zinc nanoparticles, Piper betle, Black gram, Soil parameters, Molecular docking

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OP-B11

GREEN-SYNTHESIZED MAGNESIUM NANOPARTICLES FROM NILAVEMBU (*Andrographis paniculata*) AND THEIR ROLE IN ENHANCING BLACK GRAM GROWTH AND SOIL HEALTH

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Abstract:

Green nanotechnology offers a sustainable and environmentally friendly approach to nanoparticle synthesis by utilizing plant-derived phytochemicals as natural reducing and stabilizing agents. In the present study, magnesium nanoparticles (MgNPs) were synthesized using the aqueous leaf extract of Nilavembu (*Andrographis paniculata*), a medicinal plant rich in bioactive compounds such as flavonoids, terpenoids, and andrographolide. The synthesized MgNPs were characterized using UV–Visible spectroscopy, FTIR, X-ray diffraction (XRD), and scanning electron microscopy (SEM), which confirmed their formation, crystalline nature, phytochemical capping, and spherical morphology. The biological efficacy of the green-synthesized MgNPs was evaluated for their impact on soil parameters, antimicrobial activity, and early plant growth promotion in black gram (*Vigna mungo*). Seed treatment with MgNPs significantly enhanced germination and seedling emergence, with the optimal concentration of 50 ppm showing the highest germination rate of 92% compared to 75% in untreated control. Treated plants also exhibited increased shoot and root length, improved vigor index, and early seedling establishment. Soil analysis indicated improved nutrient availability and microbial regulation. In addition, molecular docking studies revealed strong interactions between Andrographis paniculata phytochemicals and key plant defense proteins, suggesting enhanced resistance mechanisms. Overall, the study demonstrates the potential of green-synthesized magnesium nanoparticles as an eco-friendly nanofertilizer and biostimulant for sustainable agricultural applications.

Keywords: Green synthesis, Magnesium nanoparticles, Andrographis paniculata, Black gram, Seed germination, Sustainable agriculture

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OP-B12

APPLICATION OF BIO-SYNTHESIZED CALCITE NANOPARTICLES FOR ENHANCING BIODEGRADATION OF CRUDE OIL

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Abstract:

The biodegradation has been the most sought method for degradation of crude oil contamination, but it has shown limited efficiency due to the hydrophobic property of crude oil. In order to overcome this drawback, we envisage the use of mineral that is capable of adsorbing crude oil, to increase bioavailability for the microbial species. The current study is an attempt to increase the bioavailability of crude oil by the application of calcite nanoparticles that are bio-synthesized in a sustainable manner from the shells of *Semibalanus balanoides* (Acorn Barnacles), collected from the hulls of ships and boats. These synthesized calcite nanoparticles were characterized using XRD, FTIR, ZETA Sizer and Potential, HR- SEM, EDS, HR-TEM and was used in crude oil biodegradation reaction units along with oil degrading bacterium *Paenibacillus dentritiformis*, isolated from crude oil contaminated site. From the 20 day study it was inferred that, oil mineral aggregates (OMA) were formed and through GCMS analysis of residual crude oil in the presence of OMA, the biodegradation efficiency was estimated to be 88%, meanwhile the biodegradation efficiency in the presence of *P. dentritiformis* alone was limited to 67%. Further investigations revealed change in the surface morphology of calcite nanoparticles, which resulted in formation of OMA due to adsorption of crude oil and reduced the hydrophobicity of crude oil. This resulted in improving the bioavailability of crude oil to *P. dentritiformis* due to which the biodegradation was enhanced.

Keywords: Acorn Barnacles, Chiral morphotype, Oil dispersion, Adsorption, Peak shift, Lattice parameter.

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OP-B13

BIOGENIC SYNTHESIS, CHARACTERIZATION AND ANTIMICROBIAL ACTIVITY OF NANOPARTICLE USING *Annona squamosa* L. LEAF EXTRACT

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Abstract:

The utilization of nano-sized drug delivery systems in herbal drug delivery systems has a promising future for improving drug effectiveness and overcoming issues connected with herbal medicine. As a consequence, the use of nanocarriers as novel drug delivery systems for the improvement of traditional medicine is critical to combating infectious diseases globally. In line with this, we here in report the biosynthesis of silver nanoparticles (AgNPs), as antibacterial agents against pathogenic bacterial and fungal strains using *Annona squamosa* L. leaf extract as a bio-reductant and bio-stabilizing agent. The synthesized metal nanoparticles were characterized by Ultraviolet–Visible (UV–Vis) absorption spectroscopy, and Scanning Electron Microscope-Energy Dispersive X-ray (SEM-EDX) method. The synthesized nanoparticles had an average particle size of 30-45 nm with AgNPs, The synthesized silver NPs showed good antibacterial activity against pathogenic bacterial strains of Gram-positive *Klebsiella pneumoniae*, Gram negative *Staphylococcus aureus* and fungal strains *Aspergillus niger* and *Candida albicans* than AgNPs that acts as a control. The obtained results offer insight into the development of benign nanoparticles as safe antibacterial agents for antibiotic therapy using *Annona squamosa* L. leaf extract.

Keywords: *Annona squamosa* L., *Staphylococcus aureus*, *Escherichia* coli, silver nanoparticles, gold nanoparticles, antibacterial activity, characterization technique.

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OP-B14

ANTI-AGING NANO SERUM FROM GOTU KOLA EXTRACT FOR FACIAL APPLICATIONS

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Abstract:

Wrinkles, decreased collagen synthesis, and a loss of elasticity are the hallmarks of aging skin, a progressive biological process. Exploration of Phyto active compounds with strong therapeutic properties has been prompted by the need for safe, natural, and effective anti-aging formulations. Triterpenoid saponins like asiaticoside, madecassoside, and asiatic acid, which are abundant in *Centella asiatica* (Gotu Kola), a traditional medicinal herb, have potent anti-inflammatory, collagen-stimulating, and antioxidant properties. However, these bioactive poor solubility, stability, and skin penetration frequently limit their therapeutic efficacy. The current study focuses on creating a Nano serum formulation with Gotu Kola extract in order to address these issues. Delivery systems based on nanotechnology improve active phytoconstituents stability, bioavailability, and controlled release, which increases dermal absorption and anti-aging effectiveness. The stability, entrapment efficiency, zeta potential, particle size distribution, and physicochemical characteristics of the produced Nano serum were assessed. To evaluate its biological efficacy, initial anti-aging tests and in vitro antioxidant activity were conducted. The findings should show that a Nano serum based on Gotu kola offers better skin-rejuvenating effects than traditional formulations, providing a new, plant-based, and biocompatible method of anti-aging skincare. This study demonstrates how herbal medicine and nanotechnology can be combined to create next-generation cosmeceuticals.

Keywords: *Centella asiatica*, Triterpenoid saponins, Nano serum formulation, Anti-aging skincare, Herbal nano cosmeceuticals.

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OP-B15

TRAILBLAZING METHODS TO VOLARIZE FOOD WASTE: THE INTEGRATION OF ARTIFICIAL INTELLIGENCE IN NANOFERTILIZERS PRODUCTION

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Abstract:

Traditional fertilizers lose more than 50% of their nutrients, leading to several environmental issues such as eutrophication. The efficiency of absorption of nutrients by the plants can be improved with the use of nanofertilizers, which are of nanoscale (less than 100 nm) through leaching. Top-down and bottom-up manufacturing techniques are used for the synthesis of these nanofertilizers from food waste in a sustainable way. The green synthesis methodology produces nanofertilizers from agro-waste, such as fruit peels and coffee grounds. Nanoparticles size and stability are controlled by temperature, pH, and extract content. By stabilising and functionalising nanoparticles, food waste metabolites such polyphenols, flavonoids, terpenoids, alkaloids, and saponins improve their bioavailability and suitability for plants. Ag and Cu from coffee grounds and peanut shells, ZnO/Ag and Ag/Cu from fruit and olive oil wastes, and nano-silica from rice husks are a few examples. Nanomaterials based on carbon are produced from biowaste through pyrolysis, hydrothermal carbonisation, and chemical activation. Microbial fermentation, enzyme-mediated conversion, integrated biorefineries, and omics platforms are examples of valuing techniques. Through xylem and phloem, nanoparticles move through plants after entering through stomatal, cuticular, or root absorption. Diffusion, polymer breakdown, and erosion are the ways that nutrients are released. Among the methods for characterisation include spectroscopy, electron microscopy, chromatography, zeta potential, and dynamic light scattering. By employing machine learning, robotics, computer vision, genetic algorithms, and neural networks for accurate trash sorting, process optimisation, and fermentation enhancement, artificial intelligence boosts output .

Keywords: Food Waste Valorisation, Nanofertilizers ,Green Synthesis, Artificial Intelligence, Sustainable Agriculture.

Sustainability is essential for long-term public health. – WHO

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OP-B16

SUSTAINABLE PRODUCTION OF PECTINASE ENZYME USING FRUIT WASTE BIOMASS AND ITS BIOTECHNOLOGICAL APPLICATIONS.

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Abstract

Pectinase is an important industrial enzyme involved in the breakdown of pectin, a major component of plant cell walls. It is widely used in food processing, textile industries, paper and pulp processing, and waste management. With increasing environmental concerns and rising agro-waste generation, the utilization of fruit waste as a substrate for enzyme production has gained significant attention.

In this study, fruit wastes such as peels and pulp were explored as low-cost and renewable sources for pectinase production. Microorganisms capable of producing pectinase were isolated and selected for enzyme synthesis. The produced enzyme was evaluated for its functional properties under different environmental conditions. Characterization studies were carried out to understand the influence of pH, temperature, incubation time, and substrate concentration on enzyme activity.

Stability analysis was performed to assess the suitability of the enzyme for storage and industrial applications. The potential application of the enzyme was further studied through product development, highlighting its practical relevance. This work emphasizes the conversion of waste biomass into value-added bioproducts and supports sustainable and eco-friendly biotechnology practices.

Keywords: Pectinase enzyme, Fruit waste biomass, Sustainable biotechnology, Microbial enzymes, Waste-to-wealth

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OP-B17

PRODUCTION AND ANALYSIS OF S*olanum tuberosum* VEGETABLE PEEL DERIVED ECO-ENZYME AND INVESTIGATION OF ITS APPLICATIONS

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Abstract:

Eco-enzymes are fermented bio-solutions produced from organic waste and are gaining importance as sustainable alternatives for environmental and agricultural applications. In this study, an eco-enzyme was produced using *Solanum tuberosum* vegetable peels through natural fermentation. The peels were fermented with jaggery and water under anaerobic conditions, and the crude eco-enzyme was collected after 60 days for analysis. Physicochemical characterization was carried out to evaluate fermentation efficiency and product maturity through pH, total dissolved solids, and biological oxygen demand. The results indicated successful fermentation and the presence of biodegradable organic constituents. Preliminary phytochemical screening confirmed the presence of tannins, terpenoids, flavonoids, and alkaloids, indicating enrichment of bioactive compounds during fermentation. The study demonstrates the effective utilization of *Solanum tuberosum* fruit peel for eco-enzyme production, supporting agro-waste valorization and sustainable resource management. However, further biochemical and functional characterization is required to confirm the enzymatic activities and potential applications of the eco-enzyme.

Keywords: *Solanum tuberosum* ,vegetable peel, eco-enzyme, environmental remediation

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OP-B18

PRODUCTION AND ANALYSIS OF *Citrus medica* FRUIT PEEL DERIVED ECO-ENZYME AND INVESTIGATION OF ITS APPLICATIONS

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Abstract:

Eco-enzymes are fermented bio-solutions produced from organic waste and are gaining importance as sustainable alternatives for environmental and agricultural applications. In this study, an eco-enzyme was produced using *Citrus medica* fruit peels through natural fermentation. The peels were fermented with jaggery and water under anaerobic conditions, and the crude eco-enzyme was collected after 60 days for analysis. Physicochemical characterization was carried out to evaluate fermentation efficiency and product maturity through pH, total dissolved solids, and biological oxygen demand. The results indicated successful fermentation and the presence of biodegradable organic constituents. Preliminary phytochemical screening confirmed the presence of tannins, terpenoids, flavonoids, and alkaloids, indicating enrichment of bioactive compounds during fermentation. The study demonstrates the effective utilization of *Citrus medica* fruit peel for eco-enzyme production, supporting agro-waste valorization and sustainable resource management. However, further biochemical and functional characterization is required to confirm the enzymatic activities and potential applications of the eco-enzyme.

Keywords: *Citrus medica,* fruit peel, eco-enzyme**,** environmental remediation

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OP-B19

EXPLORING PIGMENT PRODUCING BACTERIA ASSOCIATED WITH QUAIL EGG FOR POTENTIAL APPLICATION

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Abstract:

Pigments are natural compounds responsible for coloration in cells and tissues, but they also serve vital biological and industrial functions. Microbial pigments produced by bacteria, fungi, and yeasts represent a sustainable alternative to synthetic dyes, being non-toxic, biodegradable, and eco-friendly. Beyond providing color, these pigments often exhibit functional properties such as antimicrobial, antioxidant, anticancer, and UV-protective activities. Their production is cost-effective, scalable using waste substrates, and valuable across food, pharmaceutical, textile, and cosmetic industries. In this study, Quail egg samples were selected as the substrate for isolate was pigment-producing bacteria, based on the observation that the outer shell exhibits significant pigmentation and nutrient richness. Samples including eggshell, egg white, and egg yolk were subjected to serial dilution and microbial isolation. A pigment-producing bacterium exhibiting bluish-green pigmentation was isolated and identified phenotypically through biochemical assays as *Pseudomonas aeruginosa*. Molecular characterization remains to be performed. The isolates were screened for the production of extracellular pigments, specifically pyocyanin and pyomelanin. Pyocyanin and pyomelanin are bioactive pigments produced by *Pseudomonas aeruginosa*. Pyocyanin exhibits antimicrobial, antioxidant, and anticancer properties, while pyomelanin shows strong antioxidant, photoprotective, and immunomodulatory effects. These pigments have potential applications in pharmaceuticals, cosmetics, and environmental biotechnology. This study advances the understanding of microbial pigment biosynthesis from quail egg-derived bacteria and explores their prospective utility in industrial and biomedical fields

Keywords: pigment, secondary metabolites, pyomelanin**,** Bioactive compound.

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OP-B20

MARINE-DERIVED *STREPTOMYCES* AS A PROMISING RESERVOIR OF BIOACTIVE COMPOUNDS

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Abstract:

Marine *Streptomyces* constitute an abundant yet largely untapped source of structurally diverse and biologically active secondary metabolites with considerable potential for pharmaceutical, industrial, and environmental applications. These microorganisms inhabit a wide range of marine ecosystems, including sediments, mangroves, saltpans, coral reefs, marine sponges, and the water column, and are capable of withstanding extreme and fluctuating conditions such as high salinity, temperature variations, and nutrient limitation. Adaptation to these environments has driven the evolution of unique biosynthetic gene clusters responsible for the production of metabolites with antibacterial, antifungal, and antiviral activities. The present study focuses on the enhanced production of antimicrobial compounds from marine *Streptomyces* through systematic optimization of growth and culture conditions to improve yield and bioactivity. Optimized conditions resulted in significantly increased antimicrobial activity against multidrug-resistant pathogens, including *Staphylococcus aureus*, *Escherichia coli*, and *Candida albicans*. The crude extracts exhibited notable thermal stability and were effectively applied as natural antimicrobial finishes on cotton fabrics, achieving complete bacterial reduction within 24 hours. In addition, the extracts were incorporated into bioactive wound dressings, demonstrating promising potential for safe and sustainable medical applications. Advanced analytical techniques, including chromatographic purification, spectroscopic characterization, and molecular identification, enabled precise structural elucidation of the metabolites and comprehensive assessment of their bioactivity. Furthermore, activation of silent biosynthetic gene clusters through co-cultivation, genetic engineering, and improved culture strategies significantly expanded metabolite diversity. Collectively, these findings highlight marine *Streptomyces* as a sustainable and eco-friendly alternative to synthetic antimicrobial agents, offering effective solutions to combat antimicrobial resistance while supporting environmentally responsible industrial and biomedical applications. Continued exploration of marine actinobacteria is essential to fully realize their therapeutic and industrial potential, contributing to improved human health and global sustainability goals.

Keywords: Marine *Streptomyces*; Antimicrobial; Secondary metabolites; optimization; drug-resistant.

The environment must be put in the category of our national security. – Robert Redford

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OP-B21

GREEN SYNTHESIS OF SILVER NANOPARTICLES USING AQUEOUS LEAF EXTRACTS OF *Hibiscus rosa-sinensis* AND *Murraya koenigii*

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Abstract:

Green synthesis involves synthesis of metal nanoparticles using extracts from plants or microorganisms, including bacteria, fungi, and algae. In this method, aqueous extract of *Hibiscus rosa-sinensis* leaves and *Murraya koenigii* leaves were boiled for 1 to 2 hours, filtered and then combined with a silver nitrate solution kept at room temperature overnight. A dark brownish-yellow colour indicates the reduction of silver ions (Ag^{+}) into metallic silver (Ag^{0}), resulting in the formation of silver nanoparticles. This reduction was facilitated by the phytochemicals and phenolic compounds present in the extracts of *Hibiscus rosa-sinensis* leaf and *Murraya koenigii* leaf. Silver nano particles were centrifuged for 15 minutes and dried in a hot air oven for 5 to 6 hours and analysed using UV-spectroscopy, Raman spectroscopy to investigate the Surface Plasmon Resonance (SPR) peak, which typically appears in the range of 380 to 500 nm and molecular composition, structure, and interactions of the nanoparticles. Particle Size Analyser (PSA) was used to analyse the particle size of the silver nanoparticles (AgNPs), while Scanning Electron Microscopy (SEM) provided detailed characterization of the silver nanoparticles (AgNPs) by examining their morphology and surface structure at high magnification. Antioxidant activity can be used in reducing the stress induced diseases.

Keywords: Green synthesis*, Hibiscus rosa-sinensis, Murraya koenigii,* silver nanoparticles, Surface Plasmon Resonance, Scanning Electron Microscopy.

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OP-B22

NITROGEN STRESS-MEDIATED PRODUCTION OF BIOACTIVE COMPOUNDS FROM MICROALGAE FOR SUSTAINABLE AQUACULTURE DISINFECTANT DEVELOPMENT

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Abstract

Bacterial infections in aquaculture systems cause major losses to the economy and encourage the development of antimicrobial resistance. This research explores the production of bioactive compounds induced by nitrogen stress in the microalgal species *Chlorella, Spirulina*, and *Scenedesmus* for the potential use of sustainable aquaculture disinfectants. The microalgae were grown in nitrogen limited conditions. The biomass after the harvest was extracted and tested for phenolic content, carotenoids, antioxidant capacity, as well as antimicrobial activity against *Vibrio* and *E. coli*. Microalgae that have undergone nitrogen, stress release more phenolic compounds and carotenoids in a significant amount than the control. The extracts boast high antioxidant and antimicrobial properties, and nitrogen, limited cultures have the highest level of bioactive compound synthesis. This research demonstrated that by using nitrogen stress as a tool, microalgae production of bioactive metabolites can be greatly enhanced. Such bio-disinfectants are a greener alternative compared to chemical ones; plus, they help in reducing the development of antibiotic resistance and hardly pollute the environment of aquaculture ponds.

Keywords: Microalgae, Nitrogen Stress, Antimicrobial Activity, Aquaculture Disinfectant, Bioactive Compounds, Sustainable Aquaculture

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OP-B23

AN OVERVIEW OF BACILLUS - FROM PRODUCTION TO APPLICATION

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Abstract:

Proteases represent one of the largest segments of the global enzyme market, with diverse applications across industrial sectors. The genus *Bacillus* stands out as the premier bacterial source for these enzymes, yielding high quantities of neutral and alkaline proteases that exhibit exceptional stability under harsh conditions, including elevated temperatures, extreme pH levels, organic solvents, detergents, and oxidants. To achieve economical production, researchers have refined fermentation conditions through systematic optimization. Low-cost substrates have proven effective in both submerged and solid-state fermentation systems. Advanced genetic approaches further enhance output: protein engineering generates variants with superior activity and stability, while strain engineering improves secretion of recombinant proteases via homologous or heterologous expression in Bacillus hosts. These enzymes power numerous applications, from detergent additives that effectively remove protein-based stains like blood, to bioactive peptide synthesis, food processing, chiral resolutions in synthesis, and leather dehairing. Dozens of commercial proteases, isolated and characterized from various Bacillus species, underscore their industrial viability. This review synthesizes current knowledge on the production, purification, characterization, and practical uses of proteases derived from key *Bacillus* species. Proteases hold a dominant position in the global enzyme market, driving sales through their versatility in industrial applications. Among bacterial producers, the genus *Bacillus* reigns supreme, delivering abundant neutral and alkaline proteases with outstanding resilience to extremes of temperature, pH, organic solvents, detergents, and oxidizing agents. Cost-effective manufacturing strategies emphasize fermentation optimization to maximize yields. Economical, agro-industrial substrates excel in both submerged and solid-state processes. Complementing these, molecular biology tools—such as site-directed protein engineering for enhanced activity and thermostability, and host strain modifications for efficient recombinant secretion—offer powerful avenues for improvement. The enzymes' utility spans multiple fields: stain removal in laundry detergents (e.g., blood and protein spots), generation of bioactive peptides, food industry transformations, stereoselective organic syntheses, and efficient dehairing in leather processing. Extensive characterizations of commercial products from diverse *Bacillus* strains highlight their proven performance. This review consolidates insights into the production strategies, purification techniques, biochemical properties, and broad applications of proteases from select *Bacillus* species.

Keywords: *Bacillus proteases*, fermentation optimization, protein engineering, industrial applications, and enzyme characterization.

We need to strengthen the conviction that we are one single human family – Pope Francis

SUSTAINABILITY THROUHG AGRICULTURE, FOOD & PLANT BIOTECHNOLOGY

(OP-APF1 – OP-APF17)

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OP-APF1

CRISPR/CAS9-ENABLED HAIRY ROOT TRANSFORMATION AND REGENERATION SYSTEM TARGETING *LbbZIP* IN *Lycium barbarum* (WOLFBERRY) FOR SUSTAINABLE AGRICULTURE AND GLOBAL MEDICINE

Teja Manda[1], Mingyue Xu[1], Wenbin Su[1] and Yang Liming[1*]

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Abstract:

Lycium barbarum L. (wolfberry), a globally recognized medicinal and nutritional crop, remains genetically underdeveloped due to inefficient transformation systems and poor regeneration capacity. This study addresses a critical gap in woody plant biotechnology by establishing a novel *Agrobacterium rhizogenes*-mediated hairy root transformation and regeneration system integrated with CRISPR/Cas9 genome editing. The objective was to enable precise genetic manipulation of key regulatory genes, such as *LbbZIP*, which influence stress tolerance, metabolite biosynthesis, and yield traits. Using optimized co-cultivation and hormonal protocols, the system achieved high transformation efficiency and successful regeneration of complete, gene-edited plants. CRISPR/Cas9-mediated editing of *LbbZIP* confirmed inheritable mutations, marking the first validated genome editing in wolfberry. This advancement provides a reproducible pipeline from gene delivery to plant recovery, overcoming genotype dependency and regeneration bottlenecks common in woody perennials. The implications are far-reaching: enhanced stress tolerance and yield potential position wolfberry as a model for climate-adaptive agriculture, particularly in arid and semi-arid regions. Moreover, the ability to tailor bioactive compound production strengthens its role in the global pharmaceutical sector, bridging traditional Chinese medicine with modern therapeutic innovation. This integrated platform sets a precedent for sustainable crop improvement, linking molecular precision with ecological and economic impact.

Keywords: *Lycium barbarum*, CRISPR/Cas9, *LbbZIP*, hairy root transformation, plant regeneration, stress tolerance, crop yield, medicinal biotechnology, sustainable agriculture, gene editing.

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OP-APF2

PHYTOCHEMICAL AND TOXICITY ANALYSIS OF *Ulva* SP., COLLECTED FROM MUTTUKADU BACKWATERS, CHENNAI.

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Abstract:

The green macroalga *Ulva* sp., used in the present study, was collected from the Muttukadu Backwaters, Chennai, India. *Ulva* sp., offers bioactive compounds with potential applications in nutrition, bioremediation, and pharmacology, though safety evaluation remains critical. This study integrates experimental and computational approaches to assess phytochemical composition, pharmacokinetics, and molecular interactions. GC-MS analysis of ethyl acetate extracts revealed a diverse metabolomic profile encompassing multiple chemical classes and trace constituents, highlighting defensive adaptations, heavy metal bioaccumulation, and halogenated metabolism. These features establish *Ulva* sp., as a promising environmental bioindicator. Toxicity assays confirmed safety: the brine shrimp lethality test showed minimal mortality with LC_{50} values exceeding standard thresholds, while the *Allium cepa* root tip assay recorded mitotic indices above critical levels, indicating absence of sublethal effects. In silico ADMET profiling using SwissADME and pkCSM predicted favourable drug-likeness, including high gastrointestinal absorption and suitable bioavailability. Molecular docking against human secretory phospholipase A2 (PDB: 1DB4) demonstrated strong ligand affinities supported by hydrogen bonding, van der Waals forces, and π-alkyl interactions. Collectively, findings validate the extract's safety for nutraceutical and biostimulant use while underscoring its pharmacological promise and ecological relevance.

Keywords: Macroalga, Phytochemical profiling, Toxicity assessment, GC-MS analysis, Molecular docking, Non-toxic extract**.**

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OP-APF3

ISOLATION OF ENDOPHYTES FROM *P. hederaceum var. oxycardium* AND DEVELOPMENT OF ENDOPHYTE-DERIVED BIOPRESERVATIVE

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Abstract:

Endophytes, mostly fungi and bacteria, are the microorganisms that live within the healthy plant tissues symbiotically without causing any harm. They are the promising sources of bioactive secondary metabolites and still, the least explored ones. These microorganisms are gaining attention due to their capability to produce the compounds with antimicrobial, antioxidant, and therapeutic effects, so they are considered as the candidates for natural bio-preservatives. Endophyte isolation encompasses rigorous surface sterilization methods to eradicate any external contaminants and usually, this involves washing in ethanol and sodium hypochlorite, followed by incubating the samples on selective media that allow the growth of the desired microorganisms and prevent the growth of the unwanted ones. The next step is characterization, which consists of morphological, biochemical, and molecular analyses that are to identify and clarify the metabolic capabilities of the isolates. The genus Philodendron, mainly *P. hederaceum var. oxycardium* is an example of a plant that hosts endophytic microbes but the study of this association is limited, therefore a research gap is created here. Studies of Philodendron-related endophytes may lead to the discovery of new bioactive compounds that might be used for organic preservatives. The mechanisms behind the antimicrobial and antioxidant activities of these compounds are microbial growth inhibition and oxidative stress reduction, respectively, and they can be applied in food preservation and therapy. The increasing problem of antimicrobial resistance presents a serious challenge, but still searching endophyte-derived bio-preservatives is an eco-friendly and innovative way out of the bottleneck of microbial contamination. The present review summarizes the existing methods of isolation and screening, assesses the bio-preservative potential of endophytes and suggests strategic directions for future research that will enable us to harness this untapped biological resource in the fight against global health and environmental issues.

Keywords: Endophytes, Bioactive secondary metabolites, Bio preservatives, antimicrobial resistance, *Philodendron hederaceum*, Antimicrobial and antioxidant properties.

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OP-APF4

EVALUATION OF CHLORELLIN AS A NATURAL PRESERVATIVE FOR FOODBORNE PATHOGEN CONTROL IN READY-TO-COOK MEAT

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Abstract

The meat processing industry is being challenged more in the aspects of microbial contamination and foodborne pathogens. This, in turn, causes an increase in demand for natural antimicrobial alternatives to synthetic preservatives. This literature review focuses on chlorellin as one of the excellent bioactive compounds for ready-to-cook meat products. *Chlorella* species, produce chlorellin a complex mixture of polyunsaturated fatty acids, bioactive peptides, and phenolic compounds exhibiting broad, spectrum antimicrobial activity against major foodborne pathogens through multiple mechanisms. This review thoroughly discusses the potential of *Chlorella* as a source of antimicrobial compounds, the chemical characterization and properties of chlorellin, antimicrobial mechanisms of action, and the application potential of meat processing. The article explains about efficacy against specific pathogens, formulation development, regulatory considerations, and commercial viability. Among other things, the review highlights the necessary knowledge and technical challenges that would enable the transition of this sustainable green antimicrobial technology from a laboratory scale demonstration to an industrial scale implementation.

Keywords: Chlorellin, Foodborne Pathogens, Microalgae Bioactives, Phenolic Compounds Ready-to-Cook Meat Preservation,

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OP-APF5

SUSTAINABLE BIO-BASED STORAGE TECHNOLOGY FOR IMPROVING ONION SHELF LIFE

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Abstract:

Post-harvest losses of onions are a significant problem for agricultural sustainability and food security, especially in developing countries with limited storage facilities. A large part of onion yield is lost due to microbial spoilage, fungal growth, moisture issues, and oxidation during storage and transportation. Traditional preservation methods often use chemical treatments that can harm human health and the environment. This underscores the need for safe, eco-friendly, and affordable options. This study introduces a natural storage method to extend onion shelf life with edible coatings made from plant materials. The approach uses agar as a biodegradable coating combined with neem, turmeric, and aloe vera extracts, known for their antimicrobial, antifungal, and antioxidant effects. Agar creates a uniform, semi-permeable layer that cuts moisture loss and restricts microbial growth. Neem and turmeric help prevent spoilage, while aloe vera adds antioxidant protection to maintain freshness. The preparation involves extracting bioactive compounds, dissolving agar at high temperatures, and cooling to protect heat-sensitive phytochemicals before applying the spray. Storage efficiency improves with constant monitoring of temperature, humidity, pH, and gas levels using integrated sensors. Feasibility studies show that the materials are cheap, easily accessible, and fit well with existing post-harvest practices, making them scalable for both small and large operations. This natural coating strategy could lower post-harvest onion losses by about 20-25% and enhance food safety by avoiding synthetic chemicals, reducing economic losses along the supply chain.

Keywords: Onion storage, bio-based edible coating, agar, neem extract, turmeric extract, aloe vera, antimicrobial activity, antifungal activity, antioxidant properties, shelf-life extension, sustainable food preservation, post-harvest technology.

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OP-APF6

CRISPR-ENABLED BIOFORTIFICATION STRATEGIES FOR ADDRESSING MICRONUTRIENT DEFICIENCY IN DEVELOPING COUNTRIES

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Abstract:

Micronutrient malnutrition, commonly known as hidden hunger, continues to pose a serious global health challenge, particularly in developing countries where staple crops constitute the major portion of daily diets. Deficiencies in essential micronutrients such as iron, zinc, and provitamin A adversely affect human health, leading to anemia, impaired cognitive development, weakened immune response, and increased disease susceptibility. Biofortification of staple crops offers a sustainable and cost-effective approach to improve nutritional intake; however, conventional breeding and transgenic methods are often constrained by long breeding cycles, limited genetic variability, and regulatory and public acceptance issues. Recent advances in CRISPR-based genome editing have enabled precise, efficient, and targeted modification of genes associated with micronutrient uptake, transport, storage, and bioavailability in crops such as rice, wheat, maize, and millets. Genome editing strategies targeting metal transporter genes, chelators, storage proteins, and anti-nutrient biosynthesis pathways have demonstrated significant improvements in micronutrient accumulation without adversely affecting yield or agronomic performance. The development of transgene-free edited crops further enhances the feasibility of adoption in developing countries by reducing regulatory barriers. Emerging approaches including multiplex genome editing, base editing, and the use of bioinformatics and artificial intelligence for gene target identification are accelerating progress in this field. Despite challenges related to biosafety assessment, off-target effects, and equitable dissemination, CRISPR-enabled biofortification represents a promising next-generation strategy for addressing micronutrient deficiency and strengthening food and nutritional security in resource-limited regions.

Keywords: CRISPR/Cas9, Biofortification, Micronutrient deficiency, Staple crops, Genome editing, Food security.

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OP-APF7

IMPACT OF MICROGRAVITY ON THE GROWTH OF PLANTS

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Abstract:

Plants are the vital part of ecosystem for survival as a source of food and oxygen. The recent researches are based on the successful cultivation of leafy crops in the International Space Station (ISS). The cultivation of plants in microgravity is an important component for the life-support in space station during long space missions. Gravity is the key factor for the growth of plants, the development of root and shoot is based on the gravitropism. Despite this, we still have limited information about how plants can sense and adapt to microgravity in space. The study investigates about the growth parameter of the plant root and shoot, seed germination physiological responses, nutritional composition and variation in chlorophyll content of the selected crop. Millets are super crops with high nutritional content and can also with stand very harsh condition and grown in arid regions, is the right crop for space agriculture. The microgravity is simulated with the instrument Clinostat. The outcome of this study contributes optimization of crop selection, supports the advancement in space agriculture for human space exploration.

Keywords: Microgravity, International Space station, Millets, Clinostat, Nutritional profiling.

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OP-APF8

HORMONAL DYNAMICS OF HYDROPONIC PLANTS IN NFT SYSTEMS FOR EFFICIENT WASTEWATER TREATMENT

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Abstract:

A spectrophotometric assay was employed to evaluate hormonal dynamics in hydroponic plants during phytoremediation of simulated and aquaculture wastewater using Nutrient Film Technique (NFT) systems under indoor and outdoor conditions. Auxin, gibberellin, and cytokinin levels were measured across six plant species (Money Plant, Crotons, Arrowhead, Brinjal, Vetiver, and Spinach) exposed to varying nitrate concentrations (30–120 mg/L) and aquaculture wastewater. After 30 days at lower nitrate levels, all species exhibited significant hormone increases, indicating favorable growth and physiological adaptation. Auxin levels increased as follows: Money Plant (13.9 ± 0.25 to 23.0 ± 0.45 units/mL), Crotons (11.7 ± 0.49 to 17.2 ± 0.09), Arrowhead (14.0 ± 0.55 to 19.1 ± 0.51), Brinjal (10.8 ± 0.29 to 16.5 ± 0.25), Vetiver (10.6 ± 0.25 to 15.2 ± 0.06), and Spinach (14.2 ± 0.07 to 21.0 ± 0.20). Gibberellin and cytokinin showed similar trends, with Arrowhead and Spinach displaying the highest increases. At higher nitrate concentrations, hormonal responses were species-dependent, with some showing reductions due to stress, while others maintained or increased levels, reflecting tolerance. Aquaculture wastewater supported balanced hormone synthesis across all species. Overall, NFT hydroponic systems effectively supported plant growth, hormone regulation, and phytoremediation, demonstrating a sustainable approach for wastewater treatment and resource recovery.

Keywords: Spectrophotometric assay, Plant growth hormones, Phytoremediation, NFT Hydroponic systems, Wastewater treatment, Plant species selection

We are the first generation to feel climate change and the last that can do something about it.
– Barack Obama

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OP-APF9

DEVELOPMENT OF BIODEGRADABLE, EDIBLE AND PH-SENSITIVE COLORIMETRIC FILMS FOR SMART FOOD FORTIFICATION USING NATURAL POLYMERS AND PIGMENTS

Meenambiga Setti Sudharsan[1*], Amjath Ahamed W

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Abstract:

Enhancements in food packaging became imperative as consumer awareness regarding the importance of eco-friendly packaging was augmented. This study endeavours to develop an edible colorimetric film with pH receptivity by harnessing an active color pigment-betalain, extracted from the inner pulp of *Opuntia ficus indica*, coupled with pectin and pulverized cellulose recovered by modified acid hydrolysis of white-fleshed citrus peel and ground nut husk respectively. Moreover, the moisture resistance and flexibility of the film were bolstered through imbuing the plasticizing agents, glycerol and gelatin. The film was fabricated by employing the solvent casting method, and its antibacterial properties exhibited a higher degree of growth inhibition against *Staphylococcus aureus* (*S. aureus*) and *Escherichia coli* (*E. Coli*). The film underwent diverse analysis to assess its physical properties, such as water solubility, moisture content, swelling index, sterility, and water vapor permeability. Surface characteristics of the film were examined through SEM analysis. The efficacy of the films in protecting meat products from oxygen and water vapor, and its color change on variation to pH during spoilage was investigated, allowing for live monitoring of perishable goods. This enables convenient monitoring of perishable food items through color change indicators, paving the way for practical packaging solutions in real-world scenarios such as smart food packaging.

Keywords: Betalain, *Opuntia ficus indica*, Pectin, Cellulose, Colorimetric pH indicator, Edible film

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OP-APF10

SUSTAINABLE PRODUCTION OF CHITOSAN FROM SHRIMP SHELL WASTE AND ITS APPLICATION IN ECO-FRIENDLY SEED COATING

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Abstract:

The increasing demand for sustainable agricultural inputs has driven interest in biopolymers derived from natural waste. Chitosan, a deacetylated derivative of chitin, is one such biopolymer with promising applications in crop production. This study focuses on the extraction of chitosan from shrimp shell waste and its subsequent application as a seed coating agent to enhance seed germination. The extraction process involved sequential demineralization, deproteinization, and deacetylation steps, optimized to yield high-purity chitosan. The extracted material was characterized using Fourier Transform Infrared Spectroscopy (FTIR) to confirm functional group integrity and Scanning Electron Microscopy (SEM) to assess surface morphology. The chitosan was then applied as a coating on selected crop seeds, and its effects on germination rate, seedling vigor, and early growth parameters were evaluated under controlled conditions. Results indicated that chitosan-coated seeds exhibited significantly improved germination percentages and uniform seedling emergence compared to untreated controls. The antimicrobial properties of chitosan also contributed to reduced incidence of seed-borne pathogens. These findings highlight the dual benefit of valorizing seafood industry waste and promoting eco-friendly agricultural practices. The study supports the integration of chitosan-based seed coatings as a viable strategy for enhancing crop establishment and sustainability in modern farming systems.

Keywords: Chitosan, Shrimp shell waste, Biopolymer extraction, Seed coating, Germination enhancement

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OP-APF11

EVALUATION OF CHLORELLIN AS A NATURAL PRESERVATIVE FOR FOODBORNE PATHOGEN CONTROL IN READY-TO-COOK MEAT

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Abstract:

The meat processing industry is being challenged more in the aspects of microbial contamination and foodborne pathogens. This, in turn, causes an increase in demand for natural antimicrobial alternatives to synthetic preservatives. This literature review focuses on chlorellin as one of the excellent bioactive compounds for ready-to-cook meat products. *Chlorella* species, produce chlorellin a complex mixture of polyunsaturated fatty acids, bioactive peptides, and phenolic compounds exhibiting broad, spectrum antimicrobial activity against major foodborne pathogens through multiple mechanisms. This review thoroughly discusses the potential of *Chlorella* as a source of antimicrobial compounds, the chemical characterization and properties of chlorellin, antimicrobial mechanisms of action, and the application potential of meat processing. The article explains about efficacy against specific pathogens, formulation development, regulatory considerations, and commercial viability. Among other things, the review highlights the necessary knowledge and technical challenges that would enable the transition of this sustainable green antimicrobial technology from a laboratory scale demonstration to an industrial scale implementation.

Keywords: Chlorellin, Foodborne Pathogens, Microalgae Bioactives, Phenolic Compounds Ready-to-Cook Meat Preservation,

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OP-APF12

GENETICALLY MODIFIED FOOD BY BIOTECHNOLOGY

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Abstract:

Genetic Modification is a technology that involves inserting DNA into the genome of an organism. To produce a GM plant, new DNA is transferred into cells of a plant. These cells are then grown in tissue culture where they transform into plants. The seeds produced by these plants will have new DNA. The most common way of inserting is using gene guns method. The other genetic engineering techniques are electroporation, microinjection and agrobacterium. Modern techniques like genetic engineering and CRISPR have improved the accuracy and efficiency of these modifications. Like all new technologies, they also pose some risks, both known and unknown. Controversies and public concern surrounding GM foods and crops commonly focus on human and environmental safety, labelling and consumer choice, intellectual property rights, ethics, food security, poverty reduction and environmental conservation. With the advent of new gene manipulation technologies, there are growing concerns about the risks of "tampering with Mother Nature," including potential unintended consequences for ecosystems, possible environmental impacts such as reduced biodiversity or the spread of modified genes to wild species, and health concerns that consumers should be aware of. At the same time, there is ongoing debate about whether recombinant technology is truly beneficial, considering both its potential advantages and its ethical, environmental, and health implications. This poster highlights the applications, advantages, and challenges of genetically modified food biotechnology.

Keywords: Abstract, Conclusion, Methodology, Research, Results, Significance

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OP-APF13

ECONOMICAL PRODUCTION, FORMULATION AND APPLICATION OF BT BIOPESTICIDES USING STARCH INDUSTRIAL WASTE WATER

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Abstract:

Bacillus thuringiensis (Bt) is one of the most widely used microbial biopesticides due to its high specificity against insect pests, safety for non-target organisms, and compatibility with sustainable agriculture. Despite its proven efficacy, the commercial adoption of Bt formulations is often constrained by high production costs, primarily driven by the requirement for nutrient-rich fermentation media. To overcome this challenge, the present study explores the economical production of Bt biopesticides using starch industrial wastewater as a low-cost substrate. Starch wastewater, abundantly generated by food-processing industries, contains carbohydrates and essential nutrients that effectively support microbial growth and toxin synthesis. Valorization of this waste stream provides dual benefits of cost reduction and environmental management. The study focuses on the optimization of fermentation parameters to maximize Bt spore and crystal protein yields, followed by formulation strategies that enhance product stability, shelf life, and ease of application. Field trials confirmed that Bt produced using starch wastewater demonstrates pest control efficiency comparable to that of conventional formulations, while significantly reducing production costs. Moreover, such biopesticides reduce dependence on chemical pesticides, improve soil health, and minimize ecological risks. This approach follows a circular economy concept by converting industrial starch wastewater into useful agricultural products. Therefore, Bt biopesticides produced from starch wastewater offer an eco-friendly, cost-effective, and sustainable solution for modern agriculture.

Keywords: biopesticides, starch industrial waste water, cost-effective production, fermentation optimization, circular economy, sustainable agriculture**.**

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OP-APF14

PRODUCTION OF HERBAL WINE FROM SELECTED FRUITS AND VEGETABLE

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Abstract:

The present study focuses on the production of herbal wine from fruit and vegetable wastes and their peels using a simple fermentation process, emphasizing sustainable waste utilization and value addition. Medicinal herbs such as Tulsi, peppermint, ginger, and tea leaves were incorporated to enhance nutritional and functional properties. Fermentation was conducted in two experimental groups. Group A consisted of all selected herbs combined with pineapple, watermelon, lemon, orange, plums, strawberries, pears, ginger, beetroot, and carrot peels. Group B included the same herbs fermented with pineapple, beetroot, and carrot wastes obtained after juice extraction. Active yeast, Saccharomyces cerevisiae, was used as the fermenting organism, and the process was carried out at room temperature for 20 days. Physicochemical parameters including pH, specific gravity, reducing sugar, and alcohol content were monitored during fermentation. Efficient fermentation was observed, with the selected herbal wine sample showing a maximum alcohol content of 15.75 percent. Nutritional analysis revealed the presence of carbohydrates, proteins, fats, sodium, iron, and appreciable energy value. The results demonstrate that fruit and vegetable wastes can be effectively converted into value-added herbal wine with good quality characteristics. The incorporation of herbs enhances health benefits and applications.

Key words: Herbal wine, Herbs, Fruits and Vegetable wastes, Peels, Health benefits.

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OP-APF15

DEVELOPMENT OF SYNBIOTIC CHOCOLATE BAR USING *Chlorella vulgaris*, *Lactobacillus.* SPP AND BUCKWHEAT FLOUR (PREBIOTIC) FOR FUNCTIONAL FOOD APPLICATION

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Abstract:

Functional foods like probiotic-enriched chocolate bars address nutritional deficiencies in omega-3 fatty acids and beneficial bacteria. The World Health Organization and Food and Agriculture Organization (FAO/WHO) defines probiotics as "live microorganisms that, when administered in adequate amounts, confer health benefits upon the host." These beneficial bacteria have gained health consciousness and expanding availability in diverse delivery formats including dairy products, cereal-based foods, fruit juices, and dietary supplements. *Lactobacillus* confers clinically documented benefits when administered at therapeutic doses of 10^6-10^9 CFU/g, improving digestion (SCFA production), immunity (IgA enhancement), and metabolic health (cholesterol reduction). Chocolate acts as carrier due to its low water activity (Aw 0.6), lipid matrix protection, and polyphenols (500 mg/100g) which helps preserve probiotics during storage (6+ months >10^6 CFU/g) and GI tract. *Chlorella vulgaris* serves as a vegan source of the fatty acids, while the *Lactobacillus* probiotics help enhance gut health and buckwheat flour provides gluten-free fiber. Among emerging probiotic carriers, chocolate has emerged due to its sensory appeal, protective lipid matrix, and bioactive compounds..These components synergistically combine to create a novel functional food product targeting cardiovascular protection, digestive health improvement.Gut dysbiosis and omega-3 deficiency are global health concerns affecting millions; synbiotic functional foods combining probiotics, prebiotics, and omega-3 sources offer a sustainable, non-pharmacological intervention. Chocolate's low water activity (Aw ~0.6) and polyphenol-rich matrix provide an ideal delivery system for preserving *Lactobacillus* viability (>10^6 CFU/g) during storage and gastrointestinal transit, while *Chlorella vulgaris* omega-3 and buckwheat prebiotics create synergistic health benefits. This project develops an innovative synbiotic chocolate bar addressing nutritional deficiencies, improving gut health outcomes, and creating a marketable functional food product aligned with consumer demand for natural, evidence-based health solutions.

Keywords: Functional chocolate, probiotics, *Lactobacillus*, *Chlorella vulgaris*, omega-3, buckwheat, symbiotic

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OP-APF16

HARNESSING PGPMS IN SOILLESS SYSTEMS: A SUSTAINABLE REVOLUTION IN AGRICULTURE

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Abstract:

Soilless farming systems like hydroponics and cocopeat cultivation provide a sustainable option compared to traditional agriculture, yet they often depend greatly on chemical fertilizers. This research examines the role of plant growth-promoting microorganisms (PGPMs) in improving plant performance and sustainability within these systems. PGPMs were isolated, identified, and assessed for beneficial properties such as nitrogen fixation, phosphate solubilization, phytohormone synthesis, and biocontrol potential. Selected microbial strains were tested under controlled soilless conditions to evaluate their effects on root and shoot development, chlorophyll levels, and nutrient absorption. The findings showed that plants treated with PGPMs exhibited enhanced growth and a decreased reliance on chemical inputs. Overall, the study emphasizes the potential of PGPMs as environmentally friendly bioinoculants for increasing crop productivity, reducing ecological impact, and promoting the long-term sustainability of soilless cultivation.

Keywords: Soilless cultivation, PGPMs, Sustainable agriculture

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OP-APF17

UTILIZATION OF BANANA PEEL AND CORN HUSK FIBERS IN BIOPOLYMER-BASED COMPOSITE SHEET

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Abstract:

The growing demand for sustainable materials has led to increased interest in biodegradable composites derived from renewable resources. This research investigates the utilization of banana peel and corn husk fibers as natural reinforcements in the fabrication of biopolymer-based composite sheets. Banana peel and cornhusk fibers, obtained from agricultural waste, were processed and incorporated into a biopolymer matrix to improve the mechanical and functional properties of the composite material. Glycerol was used as a plasticizer to enhance flexibility and processability. The prepared composite sheets were characterized for mechanical strength, water absorption behavior, and biodegradability. The results demonstrate that the inclusion of natural fibers significantly enhances the tensile properties and structural stability of the biopolymer sheets while maintaining their biodegradable nature. The synergistic effect of banana peel and cornhusk fibers contributes to improved performance compared to the neat biopolymer matrix. This study highlights the potential of agro- waste derived fibers indeveloping eco-friendly composite sheets suitable for applications such as biodegradable packaging and sustainable material products

Keywords: Biopolymer-basedcomposites, Bananapeelfiber, Cornhuskfiber, Agro-wasteutilization, Biodegradable materials, Natural fiber reinforcement, Sustainable packaging, Composite sheets

BIOTECHNOLOGY IN LIFESTYLE FOR ENVIRONMENT

(OP-EBT1 – OP-EBT15)

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OP-EBT1

GREY WATER TREATMENT

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Abstract:

This research presents a novel and sustainable strategy for mitigating environmental pollution by proposes an integrated, decentralized grey water management system to address water pollution. Large amounts of household grey water (from sinks, bathrooms, laundry) are wasted daily without reuse, The solution combines a three-tiered natural filtration system to enable safe reuse. Deploying a three-tiered system: household coir-biochar pods, lane-level bio swales, and regeneration wells. At the household level, grey water from kitchens, bathrooms, and laundry is pretreated using pods containing coir, biochar, and mycelium.

Water then flows into lane-level vegetated bio-swales for further purification is done by regeneration tanks. To encourage adoption, an incentive model using Greywater Credits is introduced. The approach is designed to be technically sound, cost-effective, and community-friendly, utilizing local materials like coir and native plants.

Key impacts include significant reduction in freshwater demand and canal pollution, enhanced flood resilience, improved soil fertility from nutrient-rich irrigation, and reduced sewage load on municipal systems. The system promotes decentralized water governance, creates local maintenance jobs, and supports broader climate and public health goals. With low setup costs, minimal maintenance, and a payback period of 2–3 years through water and fertilizer savings, this scalable solution offers a sustainable model for urban and semi-urban areas facing water stress.

Keywords: Environmental Pollution; Grey water Treatment; Purification; Fresh water Demand; Soil Fertility; Low cost

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OP-EBT2

SUSTAINABLE BIOLOGICAL HYDROGEN GENERATION FROM DOMESTIC WASTEWATER USING A DUAL-CHAMBER MICROBIAL ELECTROLYSIS CELL.

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Abstract:

Microbial electrolysis cells (MECs) are an emerging and cutting-edge method for producing biological hydrogen sustainably from wastewater streams and renewable biomass. Enhancing hydrogen production rates while reducing external energy input, however, continues to be a major obstacle in the development of MEC. Dual-chamber microbial electrolysis cell systems with electrochemical support provides a viable method for producing sustainable and renewable energy. The current study assessed the possibility of using carbohydrate-rich effluents by using residential wastewater as the substrate for biohydrogen generation. In order to increase hydrogen yield, the experimental study concentrated on enriching microorganisms that produce hydrogen and optimising biological process parameters. Different electrode materials, substrate kinds, and bacterial cultures were used to optimise the process. In microbial electrolysis tests utilising household wastewater, organic matter was broken down by electrochemically active bacteria when a low external voltage (>0.2 V) was applied in a specifically made dual-chamber MEC. With an 8.2% hydrogen yield and higher gas production rates, the system showed improved hydrogen generation. Carbon rod anodes combined with titanium plate cathodes performed better than other electrode materials like platinum and stainless steel among the electrode combinations examined. These results demonstrate the potential for effective biohydrogen production from household wastewater using dual-chamber MEC systems combined with optimised electrode materials.

Keywords: Biological hydrogen, Wastewater, anaerobic bacteria, Electrolysis, Hydrogen yield

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OP-EBT3

MOLECULAR CHARACTERIZATION AND IN VITRO SCREENING OF ENDOPHYTIC BACTERIA FOR HEAVY METAL BIOACCUMULATION

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Abstract:

Heavy metal contamination of soil and water ecosystems poses a serious threat to environmental sustainability and human health. Conventional remediation methods are often expensive, energy-intensive, and may result in secondary pollution. Endophytic bacteria inhabiting internal plant tissues offer a sustainable alternative due to their inherent tolerance to heavy metals and ability to facilitate bioaccumulation and detoxification. The present study investigates the isolation, molecular identification, and in vitro screening of endophytic bacterial isolates for heavy metal bioaccumulation potential. Endophytic bacteria were isolated from the metal-tolerant plant *Kalanchoe pinnata* and subjected to preliminary characterization through Gram staining and biochemical analyses. In vitro screening revealed significant tolerance to cadmium, lead, and copper, and minimum inhibitory concentration studies enabled the selection of efficient metal-tolerant isolates. Growth optimization studies indicated optimal bacterial growth at pH 7 and 25 °C. In the second phase of the study, optimized bacterial cultures were sub-cultured and processed for molecular analysis. Genomic DNA was successfully isolated, demonstrating high quality and absence of contamination. NanoDrop spectrophotometric analysis confirmed adequate DNA purity and concentration, while agarose gel electrophoresis showed distinct and intact DNA band patterns. Polymerase chain reaction (PCR) amplification further validated the presence and integrity of bacterial genomic DNA. The findings of this study highlight the effectiveness of endophytic bacteria as eco-friendly bioagents for heavy metal bioaccumulation and support their application in sustainable bioremediation approaches.

Keywords: Endophytic bacteria; Heavy metal bioaccumulation; Bioremediation; *Kalanchoe pinnata*; Molecular identification

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OP-EBT4

BIOGAS PRODUCTION FROM TANNERY WASTE: A POTENTIAL ALTERNATIVE FOR WASTE MANAGEMENT AND ENERGY SUSTAINABILITY

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Abstract:

The tanning industry plays a significant role in environmental challenge due to its generation of massive quantities of solid and liquid by-products, specifically tannery flashings, shavings, chrome sludge, and wastewater. These wastes are densely carries with an organic matter, proteins, fats, and hazardous chemical residues, including sulphides and chromium. Improper disposal of these effluents effectively leads to severe soil and groundwater contamination, Odor pollution, and acute health risks for both human populations and local ecosystems. However, biogas production through anaerobic digestion offers a promising, sustainable alternative for waste management. While the high organic content of these materials suggests a strong potential for bioenergy recovery. This limitation is primarily due to the presence of inhibitory substances, such as heavy metals and high sulphide concentrations, which can toxify the system and disrupt the metabolic activity of methanogenic bacteria. The proposed study done by Enzymatic Hydrolysis as a primary pretreatment breakdown of complex organic matter into simpler molecules. This method bypassed the acidogenesis in methanogenic activity and faster the methane production. This biotechnological approach provides a dual benefit it effectively mitigates the environmental pollution in the leather sector by reducing hazardous waste. Simultaneously maximizing the recovery of renewable energy methane.

Keywords:

Anaerobic Digestion, Tannery Waste, Methane Yield, Enzymatic Hydrolysis, Renewable Energy, Reduce Pollution.

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OP-EBT5

USEFUL EFFECTS OF MFC'S IN WATER POLLUTION

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Abstract:

Imagine powering a small LED light using bacteria from backyard mud—no batteries needed! Our MFC treats wastewater while producing renewable electricity, solving pollution and energy crises in one device."Microbial fuel cells (MFCs) are bioelectrochemical devices that generate electricity from organic waste using bacteria or microbes. Microbial fuel cells (MFCs) offer an innovative biosciences solution to wastewater treatment and clean energy generation, converting organic pollutants in wastewater into electricity while cleaning water. This dual-purpose technology is unique in harnessing microbial metabolism for simultaneous remediation and power production, essential for urban areas facing pollution and energy shortages. Key Benefits include Treating wastewater (e.g., removes 80-90% COD) while generating 0.1-5 W/m² power, scalable for homes or industries, Reduces sludge by 90% compared to traditional methods, minimizing waste and Low-cost materials like carbon cloth electrodes make it affordable for developing regions. (MFC) prototype that generates electricity from pond sludge or wastewater with recent advances integrate AI for optimization, boosting efficiency by 30%.Implementation Steps Design modular MFC stacks with local microbes acclimated to site wastewater . Monitor via IoT for voltage and pollutant levels; scale from lab (1L) to community (1000L).Partner with biotech firms for genetic tweaks enhancing electron transfer.

Keywords: Microbial fuel cells, Energy generation, Renewable electricity, Wastewater treatement, Water Pollution.

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OP-EBT6

CONGO RED RECOVERY FROM WATER USING GREEN EXTRACTION SOLVENTS

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Abstract:

Several industries, especially textile, use dye pollutants that end up dumped as wastewater, contributing to water pollution. Within the framework of improving water quality, a separation technique termed as “liquid liquid extraction” is widely used to remove pollutants from water, due to the possibility of recovering all the involved agents. Herein, deep eutectic solvents (DESs) based on mixtures of thymol with menthol, coumarin, octanoic acid and decanoic acid were applied as extraction agents to remove congo red from water. Among all the studied solvents, those formed by thymol with organic acids showed extraction efficiencies higher than 90% for low initial concentrations of congo red, using 1/5 (v/v) DES/water proportion and 1 h of stirring time as extraction parameters. The best results were achieved using Thymol:Octanoic acid (1:1) solvent. Furthermore, at the end of the process each reagent can be reused. DES reusability was checked for three extraction cycles, keeping stable. To sum up, in this work is not only described the extraction procedure of a pollutant from water, but also the recovery of this dye and the reagents involved in the process.

Keywords: Azo dye, Deep eutectic solvent, Congo Red ,Liquid-liquid extraction, Water remediation.

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OP-EBT7

APPLICATION OF A FUNGAL ENZYME IN SUSTAINABLE DEVELOPMENT

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Abstract:

Plastic pollution, especially polystyrene microplastics, poses a severe threat to aquatic and terrestrial ecosystems due to its persistence and resistance to natural degradation. Laccase enzymes are multicopper oxidases known for degrading complex polymers like lignin and have recently gained attention for plastic biodegradation. *Grammothele* species are ligninolytic fungi with unexplored biotechnological potential. This study investigates laccase from *Grammothele* sp. as an eco-friendly solution for polystyrene degradation. The fungal strain was isolated and molecularly identified as *Grammothele* sp., followed by the extraction and purification of laccase using ammonium sulfate precipitation and Sephadex G-100 chromatography. The purified enzyme was characterized for molecular weight, optimal pH, temperature, kinetics, and inhibitor sensitivity. Polystyrene degradation was evaluated over 120 days using weight loss analysis, FTIR, and SEM. The purified laccase from *Grammothele* sp. showed a molecular weight of ~63 kDa and exhibited maximum activity at pH 6.0 and 27 °C, indicating suitability for environmental conditions. Kinetic analysis confirmed efficient catalytic activity, while inhibitor and metal-ion studies revealed sensitivity to chelating agents and heavy metals. Significant polystyrene degradation was observed during purified enzyme treatment, as evidenced by FTIR, which showed aromatic ring disruption and the formation of carbonyl groups. SEM images confirmed severe surface erosion and fragmentation of polystyrene particles. These results demonstrate that *Grammothele* sp. laccase is an effective biocatalyst for polystyrene biodegradation, supporting its potential application in plastic waste bioremediation. Laccase from *Grammothele* sp. demonstrates significant potential for biodegradation of polystyrene microplastics under mild environmental conditions. The enzyme effectively alters polymer structure, leading to measurable chemical and physical degradation.

Key words: Fungal enzyme, *Grammothele* sp, Biodegradation, Bioremediation

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OP-EBT8

BREWING ENERGY FROM WASTE: SUSTAINABLE BIOETHANOL FROM AGRO-INDUSTRIAL WASTES

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Abstract:

In developing countries, agro-industrial waste is often deposited in open dumps resulting in the release of unpleasant odors and greenhouse gases. The prolonged disposal in the form of leachate contaminates the soil and water and leads to the loss of valuable organic matter and energy-rich materials. The renewable energies that generated from agro-industrial waste can be converted into various forms of energy as sustainable and renewable energy solution. Some of the energies generated from agro-industrial wastes include biogas, bioethanol, biodiesel, bio-oil, biopower, hydrogen etc., which reduces the dependence on fossil fuels. They also provide a valuable opportunity for waste management and environmental benefits. Our study focuses on converting agro-industrial waste like citrus peels, spent coffee grounds and egg-shell waste into sustainable bioethanol, thereby reducing the environmental pollution. The conventional agro-waste bioethanol processes use chemical over liming or activated carbon would create a negative impact on the environmental nutrition and microbiome. The current study uses agro-industrial wastes as a potential renewable source for the production bioethanol with minimal chemical use and enriching waste management.

Kewords: Agro-Industrial Waste, Bioethanol, Sustainable, Waste management

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OP-EBT 9

BIOREMEDIATION OF HEAVY METALS USING MICROBIAL BIOSURFACTANTS

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Abstract:

In recent years, river pollution has emerged as a serious and escalating issue in many developing countries. The discharge of industrial effluents and untreated sewage into water bodies is a major source of environmental toxicity, posing severe threats to aquatic life and degrading water quality. Biological methods for the removal of heavy metals from industrial waste may provide an attractive alternative to the physiochemical process. Biosurfactants are one of the compounds that help in alleviating the heavy metals. A large number of bacteria such as *Psudomonas sp*, *Bacillus sp*, *Acinetobacter sp*, *Arthrobacter sp* are reported to produce biosurfactants. Compared to synthetic compounds, biosurfactants provide the advantages of little or no environmental impact and the possibility of in-situ production. Studies in recent past have exhibited the successful use of biosurfactants for facilitating the degradation of organic pollutants in soil and water. In the light of the above, the present study is aimed to carry out the assessment efficiency of biosurfactants producing bacteria isolated from heavy metal contaminated sites of the Vellarur river, Cuddalore District, Tamilnadu. Nine distinct bacterial strains were isolated and identified based on morphological characteristics and 16S rRNA gene sequencing as *Achromobacter denitrificans*, *Bacillus flexus*, *Achromobacter xylosoxidans*, *Bacillus cereus*, *Pseudomonas medocina*, *Pseudomonas putida*, *Bacillus badius*, *Lysinibacillus xylanilyticus*, and *Exiguobacterium homiense*, showing 99% sequence homology. The haemolytic activity, emulsification activity, drop-collapse test, and oil displacement test were employed to assess the biosurfactant-producing potential of the isolated bacterial strains. Among them, *Pseudomonas putida* isolates demonstrated the ability to remove heavy metals from the medium.

Keywords: Biosurfactants, Heavy metals, Detoxification, *Pseudomonas putida*.

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OP-EBT10

THE ISOLATION, MOLECULAR CHARACTERIZATION, AND ANTIMICROBIAL POTENTIAL OF *Streptomyces rubrogriseus* AN ENDOPHYTIC ACTINOMYCETE ISOLATED FROM A MARINE ALGAE *Grateloupia lithophila*

S. Srinivasan[1], R. Karthick[1], S. Pravin Kumar[2], M. Lakshmanan[1], S.V Bhuvanesh[1], Kalyanaraman Rajagopal[1*]

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Abstract:

The marine intertidal zone serves as a vital reservoir of algae and their associated microbiomes because of its unique ecological niche. In current investigation, the antimicrobial potential of *Streptomyces rubrogriseus* an endophytic actinomycete isolated from the red alga *Grateloupia lithophila*, thallus from Ennore coast, Chennai. Surface-sterilized algal samples were crushed and different dilution at concentrations of 10-1 to 10-6 were prepared and plated on selective media such as Actinomycetes isolation agar (AIA), Starch casein agar (SCA), Inorganic salt starch agar (ISP-4), and Oatmeal agar (OMA). A distinct powdery, spore-forming isolate was obtained and further identified using molecular technique 16s rRNA gene (1500 bp) as *Streptomyces rubrogriseus* at CSIR-NCIM. Submerged fermentation was conducted in Tryptic Soy Broth (TSB) for 10 days. Secondary metabolites were obtained and extracted using Polar solvent (Ethyl acetate) and Non-Polar (Chloroform) the extracts were separated and concentrated at 40°C and quantified. The crude extract was evaluated for its ability to fight off clinically important pathogens. The outcome of the study will be presented.

Keywords: Seaweed, Endo actinomycetes, *Streptomyces rubrogriseus*, Bioactive metabolites, antimicrobial activity.

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OP-EBT11

AI-ENGINEERED PETASE: A BIOREMEDIATION BREAKTHROUGH AGAINST PLASTIC POLLUTION

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Abstract:

The escalating accumulation of plastic waste, particularly polyethylene terephthalate (PET), represents a major environmental challenge, undermining ecosystem health and sustainable development goals. Conventional recycling strategies are constrained by high energy demands, economic inefficiencies, and material degradation, necessitating innovative and sustainable alternatives. The identification of *Ideonella sakaiensis* and its PET-degrading enzyme, *PETase*, established a biological foundation for PET bioremediation; however, the native enzyme exhibits suboptimal catalytic efficiency and limited operational stability, restricting large-scale implementation.

Recent advances in artificial intelligence (AI) have enabled a paradigm shift in enzyme engineering, offering powerful tools for the rational optimization of biocatalysts. AI-based structure prediction platforms such as alpha fold, machine learning–guided mutational analysis, and molecular dynamics simulations facilitate precise identification of functional residues, enhance enzyme–substrate interactions, and improve thermostability. These approaches have led to the development of high-performance *PETase* variants, including *FAST-PETase*, capable of rapid PET depolymerization under ambient conditions. The resulting monomers can be recovered with high purity, supporting closed-loop recycling and reducing reliance on virgin plastic production.

AI-engineered *PETases* demonstrate significant potential beyond recycling, with emerging applications in wastewater treatment, landfill remediation, and environmental restoration. Despite these advances, challenges related to long-term enzyme stability, biosafety considerations, and economic scalability remain. Future strategies involve integrating PETase with complementary hydrolases, designing synthetic biological systems for mixed plastic waste, and leveraging automated AI-driven platforms for accelerated enzyme evolution. Overall, AI-enabled PETase engineering represents a transformative and sustainable biotechnological solution for plastic pollution management, aligning with global environmental priorities and the Viksit Bharat vision for sustainable innovation.

Keywords: AI-driven enzyme engineering, Plastic bioremediation, AI-optimized PETase variants, Environmental pollution management, Sustainable biotechnology, Circular bioeconomy.

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OP-EBT12

ADSORPTIVE REMOVAL OF HEAVY METALS FROM INDUSTRIAL WASTEWATER USING SUGARCANE BAGASSE ASH AND CHITOSAN-BASED BIOSORBENT SYSTEM

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Abstract:

Industrial wastewater often contains toxic heavy metals such as lead, cadmium, chromium, copper, and mercury, which pose serious environmental and health hazards due to their persistence and bioaccumulative nature. Conventional treatment methods, including chemical precipitation, ion exchange, and membrane filtration, are effective but limited by high operational costs and secondary pollution. In recent years, biosorption has emerged as a sustainable and cost-effective alternative for heavy metal removal. Adsorptive potential of sugarcane bagasse ash (SCBA), corn hub, bannana peels, an agro-industrial byproduct, and chitosan, a biopolymer derived from chitin, as individual and composite biosorbents. SCBA provides a porous structure and abundant functional groups, while chitosan contributes amino and hydroxyl groups with strong affinity for metal ions. When combined, these materials form a synergistic biosorbent system with enhanced adsorption capacity, mechanical stability, and reusability. Characterization techniques such as FTIR, SEM, and BET surface analysis confirm the presence of active binding sites and improved structural properties. Overall, the integration of sugarcane bagasse ash and chitosan offers a promising, eco-friendly solution for the removal of heavy metals from industrial effluents, contributing to sustainable wastewater management and circular economy practices.

Keywords: Heavy metals, Chitosan, Sugarcane bagasse ash, Biosorption, sustainable wastewater management

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OP-EBT13

BIOFUEL PRODUCTION FROM COTTON SEED WASTE VIA CATALYTIC PYROLYSIS AND ENHANCEMENT USING LITHIUM–SBA-16 CATALYST: A SUSTAINABLE WASTE-TO-ENERGY APPROACH

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Abstract

Rising global energy demand and the environmental concerns associated with fossil fuel use have intensified the need for renewable and sustainable biofuel alternatives. Agro-industrial residues such as cotton seed waste are produced in large quantities but remain largely underutilized, despite their lignocellulosic richness and residual oil content. In this study, cotton seed waste was investigated as an inexpensive biomass feedstock for biofuel generation through catalytic pyrolysis. Pyrolysis was conducted under controlled conditions using a ZSM-5 catalyst to promote the conversion of biomass vapors into fuel-grade hydrocarbons and to enhance the yield and quality of bio-oil. In addition, a mesoporous Lithium–SBA-16 catalyst was synthesized for hydroprocessing/upgrading of the produced bio-oil, aiming to reduce oxygenated components, improve stability, and increase calorific value. The resulting bio-oil was characterized using FTIR and GC–MS to determine its chemical composition and fuel properties in comparison with conventional diesel. Alongside bio-oil, biochar was obtained as a valuable co-product and explored for multifunctional environmental applications. The biochar was assessed for the removal of synthetic dyes and heavy metal ions from wastewater, demonstrating its effectiveness as a low-cost adsorbent. Its potential use as a soil amendment was also highlighted, as its physicochemical characteristics can enhance soil fertility, promote carbon sequestration, stimulate microbial activity, and improve nutrient retention, thereby supporting soil health. Overall, this work presents an integrated waste-to-energy strategy that converts cotton seed waste into upgraded bio-oil while producing biochar with significant environmental remediation and agricultural benefits, contributing to the advancement of a sustainable circular bioeconomy.

Keywords: Catalytic pyrolysis, ZSM-5 catalyst, Bio-oil, Hydroprocessing, Lithium–SBA-16 catalyst, Dye adsorption, Heavy metal adsorption, Wastewater treatment, Soil health indicator.

Sustainable development balances environmental protection, economic growth, and social equity.
– United Nations

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OP-EBT14

SUSTAINABLE REMOVAL OF HEAVY METALS USING AGRICULTURAL WASTE BIOMASS

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Abstract:

The existence of heavy metal pollution presents environmental and health risks which contaminate both water bodies and soil. The agricultural sector has identified biomass from crops as an economical and environmentally friendly solution to remove heavy metals through biosorption. The agricultural waste materials which consist of rice husks wheat straw corn stalks and fruit peels along with crop residues can effectively remove toxic metals which include lead cadmium chromium mercury copper zinc and nickel. Biosorption occurs through mechanisms which include ion exchange complexation precipitation and physical adsorption which functional groups on biomass surfaces enable. Chemical activation combined with thermal treatment techniques produces better adsorption results which achieve over 90% removal efficiency. The different biomass materials demonstrate adsorption capacity ranges from 10 to 500 mg/g which depends on the particular metal content and biomass variety. The process depends on pH contact time temperature initial metal concentration and biomass dosage as its main operational parameters. The method provides support for sustainable remediation practices while it upholds circular economy principles.

Keywords: Heavy metal pollution, Agricultural biomass, Biosorption mechanism, Wastewater remediation, Sustainable adsorption

Economic growth without environmental considerations can cause serious environmental damage.
– Ban Ki-moon

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OP-EBT15

INTEGRATED FERMENTATION AND CATALYTIC PYROLYSIS OF FRUIT WASTE FOR SUSTAINABLE BIOFUEL PRODUCTION

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Abstract

The rapid exhaustion of fossil fuel resources and increasing environmental issues linked to petroleum-derived energy have strengthened the need for renewable and sustainable biofuels. In this work, an integrated biorefinery strategy was designed to efficiently utilize fruit waste as an inexpensive and environmentally friendly feedstock for biofuel production. Fruit waste collected from local markets was first subjected to fermentation to produce bioethanol, and the remaining non-fermentable biomass was subsequently converted into bio-oil through catalytic pyrolysis. Pyrolysis was performed in the presence of a ZSM-5 catalyst to promote the cracking of biomass vapors and enhance the production of hydrocarbon-rich bio-oil. In addition to bio-oil, biochar was obtained as a valuable co-product. The resulting bio-oil was further upgraded via hydrodeoxygenation using a Li–Cu dimetal bentonite catalyst, which significantly reduced oxygenated compounds and thereby improved fuel quality, stability, and calorific value. The upgraded bio-oil was characterized using FTIR and GC–MS to verify the improvement in chemical composition and the reduction in oxygen-containing functional groups. Moreover, engine performance tests were carried out using the upgraded oil and its blends to assess its suitability as an alternative fuel, with emphasis on combustion efficiency and emission behavior. The biochar produced during pyrolysis was also investigated for environmental applications, including adsorption of oil spills and removal of antibiotic pollutants from water, demonstrating its potential for wastewater remediation. Overall, this study presents a sustainable circular approach for converting fruit waste into bioethanol, upgraded bio-oil, and functional biochar, supporting effective waste management, renewable energy production, and environmental protection.

Keywords: Bioethanol, Catalytic pyrolysis, ZSM-5 catalyst, Bio-oil, Li–Cu dimetal bentonite catalyst, Biochar, Wastewater remediation.

A society grows great when old men plant trees whose shade they know they shall never sit in.
– Greek Proverb

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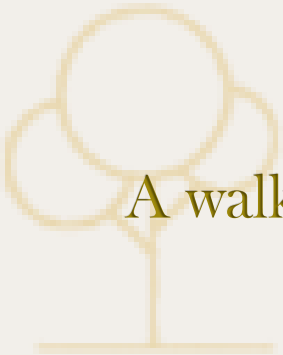

A walk in nature walks the soul back home

-Mary Davis

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P1

SUSTAINABLE CIRCULAR ECONOMY INSPIRED ENHANCEMENT OF SEED GERMINATION VIA HUMAN HAIR DERIVED CARBON NANODOTS MEDIATED SEED NANO-PRIMING

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Abstract:

With the projection that the world population will reach 9.7 billion by 2050 with an associated global food demand surge by 35%–56% from 2010 to 2050; incorporation of innovative technologies into traditional farming for sustainable agriculture has become the need of this hour. With one of the seventeen SDG goals focusing towards "zero hunger", a huge emphasis is laid on agriculture and food crops. Seed nano-priming is an advanced strategy tuned to facilitate seed germination, enhance seedling development and reinforce stress tolerance. Seed priming is sought as a substitute to application of large amounts of nanomaterials to the growth medium or as whole plant foliar spray. Nanotechnology stands debated owing to its environmentally unfriendly synthesis processes and its fate in the environment as a nanotoxicant, SDG Goal 12 emphasizes on sustainable consumption and production methods and circular economy. In this perspective, the following study aligns with the eco-friendly production of carbon nanodots from waste human hair . The hair derived carbon nanodots were synthesized using thermal oxidation at 250ºC, 550ºC and 750ºC and characterized using physical and chemical characterization tools. The human hair derived carbon nanodots were observed to lie within the nanosize regime of less than 10nm. Carbon nanodots being readily able to self assemble onto solid surfaces introduced into aqueous nanoparticle suspensions, were used for nano-priming green gram, rice and green pea seeds. Nano-priming was carried out immersing the seeds in five varying CDs concentrations for 12 hours. The effect of the CDs nanopriming on seed germination, shooting and rooting was investigated. The results, indicated enhanced seed germination, shooting, rooting as well as protease activity in case of all three food crops analyzed. The study confirmed that even at very high concentrations the hair derived carbon nanodots obtained at thermal oxidation of 250ºC and 550ºC showed no toxicity, CDs@750 ºC exhibited marginal inhibition at high concentrations. The results indicated that the CDs prepared at varying temperatures of 250ºC, 550ºC and 750ºC, did influence their nano-priming properties. Lower temperature thermally oxidized CDs showed higher seed germination activity even at very high concentrations, while higher temperature CDs displayed inhibitory effects at higher concentrations. The salient findings from these investigations have been reported in this paper.

Keywords: Carbon nanodots; hair; seed nano-priming; sustainable; germination; thermal oxidation

Nature does not hurry, yet everything is accomplished – Lao Tzu

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P2

SYNTHESIS OF BIMETALLIC NANOPARTICLES AL-CU (ALUMINIUM-COPPER) AND EXAMINATION OF ITS ANTIMICROBIAL ACTIVITY AND DYE DEGRADATION

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Abstract:

The study focused on Bimetallic nanoparticles are gaining importance due to its increased efficiency in various applications. The present study focuses on the synthesis of bimetallic nanoparticles of Aluminium-Copper (Al-Cu) via a chemical redox reaction. The synthesized Al-Cu nanoparticles were characterized using UV-visible spectroscopy, FTIR spectroscopy, SEM, and zeta potential analysis. The characterization studies reveal that the metals form alloys and interact through UV-Vis analysis and FTIR analysis. It was observed from SEM analysis and zeta potential analysis that the synthesized bimetallic nanoparticles were spherical and polydisperse with a zeta potential of 30 mV, proving its stability. They were studied for antimicrobial activity against both gram-positive and gram-negative bacteria. Additionally, these were also analyzed for their potential in dye degradation in wastewater, contributing to environmental remediation. The antimicrobial activity with 10 mm inhibitory zone for Pseudomonas aeruginosa and Staphylococcus aureus shows the efficiency of synthesized Al-Cu nanoparticles against the gram-positive and gram-negative bacteria. The dye degradation study also revealed that the synthesized Al-Cu nanoparticles can degrade methylene blue with a maximum degradation of 71% at 24 hrs. The study also explored the application of Al-Cu bimetallic nanoparticles in agriculture through a seed germination study, which proved that these nanoparticles can be used effectively in agriculture. Overall, the results highlight the multifaceted potential of Al-Cu bimetallic nanoparticles in antimicrobial applications, wastewater treatment, and agriculture.

Keywords: Methylene blue, UV spectroscopy, FTIR spectroscopy, wastewater treatment

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P3

LACCASE IMMOBILIZATION ON FE/NI-CHITOSAN NANOCOMPOSITES FOR EFFICIENT BISPHENOL S DEGRADATION

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Abstract:

Bisphenol S (BPS), a common industrial substitute for the toxic Bisphenol A (BPA), poses significant environmental and health risks due to its persistence in wastewater, sediments, and consumer products. This study investigates the immobilization of laccase enzyme onto Fe/Ni-chitosan nanocomposites to develop an efficient nano-biohybrid system for BPS degradation. The approach leverages the synergistic catalytic properties of bimetallic Fe/Ni nanoparticles with the oxidative capability of laccase, stabilized by chitosan biopolymer for enhanced reusability and environmental compatibility. The research objectives include synthesis of Fe/Ni bimetallic nanoparticles through chemical co-precipitation, surface modification with chitosan, and covalent immobilization of laccase via crosslinking chemistry. The nanocomposites will undergo comprehensive structural characterization using advanced techniques. This nano-biocatalyst platform addresses the critical need for sustainable wastewater treatment technologies targeting emerging contaminants, offering advantages over conventional methods through catalyst recyclability and operational stability. The developed system holds promise for scalable environmental applications, contributing to pollution management and green nanotechnology solutions for water purification.

Keywords: Laccase immobilization, Fe/Ni nanocomposites, Bisphenol S degradation, nano-biocatalyst, wastewater treatment

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P4

ECO-ENGINEERED CNT/GO-CHITOSAN COMPOSITE FUNCTIONALIZED WITH NATURAL DEEP EUTECTIC SOLVENTS FOR SUPERIOR HEAVY METAL ABSORPTION

T Darwin[1] & Dr. Chris Felshia[2]*

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Abstract:

Heavy metals like lead and mercury pollute water and harm health, so we need better ways to remove them. This study creates a smart material by mixing carbon nanotubes (CNT), graphene oxide (GO), and chitosan—a natural glue from shrimp shells. We enhance it with natural deep eutectic solvents (NADES), eco-friendly liquids made from sugar and acids, to boost its ability to grab heavy metals.

The composite works like a super sponge: CNT and GO provide a strong, high-surface-area structure, chitosan adds stickiness for metal binding, and NADES tunes it for maximum absorption. Tests show it removes over 95% of metals like Cd^{2+} and Pb^{2+} from water at low concentrations, even in acidic conditions, outperforming traditional filters.

It's cheap, biodegradable, reusable up to 5 cycles with 90% efficiency, and avoids toxic chemicals. This eco-engineered filter offers a green solution for clean water in polluted areas.

Keywords: Heavy Metals, Carbon nanotubes, Graphene oxide (GO), Chitosan, Natural Deep Eutectic Solvents (NADES), Biodegradable

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P5

EVALUATION OF THE ANTIOXIDANT AND RADIOPROTECTIVE PROPERTIES OF AQUEOUS BLACK RICE EXTRACT AND ITS INTERACTION WITH THE NRF2–KEAP1 PATHWAY: *IN VITRO* AND *IN SILICO* APPROACHES

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Abstract:

Black rice (*Oryza sativa* L. *indica*) is a rich source of bioactive antioxidants. The present study reports the development of an optimized aqueous extraction method to enhance the recovery of water soluble antioxidant constituents from black rice and evaluates its radioprotective potential using *in vitro* and *in silico* approaches. The aqueous black rice extract was characterized using UV-Visible spectroscopy, Fourier Transform Infrared (FTIR) spectroscopy, and Liquid Chromatography Mass Spectrometry (LC-MS). Antioxidant activity was assessed through DPPH, ABTS, and FRAP assays, while molecular docking was performed to explore interactions with the Keap1-Nrf2 antioxidant signalling pathway. UV-Visible analysis revealed a characteristic absorption band at 530-540 nm, indicating anthocyanin-rich content, and FTIR confirmed the presence of phenolic functional groups. LC-MS profiling identified several phytochemicals, including compounds not previously reported in aqueous black rice extracts and exhibited concentration-dependent antioxidant activity across all *in vitro* assays. Molecular docking demonstrated a strong binding interaction with Keap1, with binding energies reaching -13.48 kcal/mol, suggesting activation of the Nrf2-mediated antioxidant defence pathway. Radioprotective efficacy was further validated using the *In vitro* experiments using human peripheral blood lymphocytes treated with aqueous black rice extract demonstrated a significant threefold reduction in chromosomal aberrations following exposure to X-irradiation (2 Gy). These findings establish aqueous black rice extract as a potent natural antioxidant with significant radioprotective potential against radiation-induced chromosomal damage.

Key words: Black rice, Phytochemicals, Antioxidant, Molecular Docking, Radioprotection

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P6

VALORIZATION OF SUGARCANE BAGASSE FOR SUSTAINABLE WATER TREATMENT

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Abstract:

Large volumes of wastewater containing hazardous heavy metals and synthetic dyes are generated by the textile industry, posing serious risks to human health and the environment. Among these contaminants, lead ions (Pb^{2+}) and dyes such as methylene blue and triphenylmethane are particularly persistent, toxic, and non-biodegradable, making their effective removal challenging. Concurrently, the sugar industry produces massive quantities of sugarcane bagasse (SCB) as agricultural waste, creating disposal and environmental management concerns. This study explores the sustainable valorization of sugarcane bagasse through its conversion into biochar and evaluates its potential as a low-cost, eco-friendly adsorbent for textile wastewater treatment. Biochar synthesized from sugarcane bagasse was assessed for its adsorption efficiency toward lead (Pb^{2+}), methylene blue, and triphenylmethane dyes. Batch adsorption experiments were carried out to investigate the effects of pH, contact time, adsorbent dosage, and initial pollutant concentration on removal performance. The results demonstrate efficient removal of both heavy metals and dyes, attributed to the biochar's high surface area, porous structure, and abundance of surface functional groups, highlighting its promise for sustainable wastewater remediation.

Keywords: Wastewater, Contaminants, Biochar, pollutant, Adsorption.

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P7

BIOINFORMATICS DRIVEN IDENTIFICATION OF THERMAL STRESS GENE NETWORKS IN CORALS: A FUTURE FRAMEWORK WITH GREEN AI AND CIRCULAR BIOECONOMY FOR SUSTAINABLE CONSERVATION

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Abstract:

Rising ocean temperatures are causing widespread decline of coral reefs by disrupting the delicate balance between the coral animal and its associated microorganisms, collectively known as the holobiont. This thermal stress often leads to coral bleaching, where corals lose their symbiotic algae, resulting in reduced growth, weakened immunity, and increased mortality. Understanding why some corals are able to tolerate heat stress while others are highly vulnerable is essential for developing sustainable reef conservation strategies. This study proposes a bioinformatics-based framework to identify genes and regulatory networks associated with thermal resilience in corals using publicly available transcriptomic datasets. Gene expression profiles of healthy corals are compared with those of heat-stressed corals to identify differentially expressed genes involved in thermal response. The analysis reveals several key groups of stress responsive genes, including heat shock proteins, antioxidant enzymes, and immune related regulators that play crucial roles in cellular protection and stress adaptation. Network analysis using Cytoscape is employed to explore gene–gene interactions and to identify hub genes that occupy central positions within stress-response pathways. These hub genes have the potential to serve as biomarkers for thermal tolerance and may help in identifying naturally resilient coral populations. Furthermore, the integration of these bioinformatics findings into energy efficient green artificial intelligence models offers a sustainable approach for predicting coral resilience across diverse reef environments while minimizing computational energy consumption. By linking molecular-level insights with circular bioeconomy principles, this approach supports sustainable reef restoration by reducing resource waste and promoting ecosystem regeneration, providing a scalable, data driven solution for coral conservation under ongoing climate change.

Keywords: Coral reefs, thermal stress, transcriptomics, bioinformatics, gene networks, sustainable conservation

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P8

ACUTE TOXICITY IN ZEBRAFISH *(Danio rerio)* EXPOSED TO HERBICIDE PRETILACHLOR

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Abstract:

Pretilachlor is a chloroacetanilide [2-chloro-2', 6' diethyl-N-(propoxy ethyl) acetanilide] herbicide commonly used for the control of grasses, sedges and some broadleaf weeds that grow with transplanted rice. It is known for its use with most of the rice breeds. This herbicide is sprayed in the standing water and elevated the greening effect to the crop. Additionally, there is an increasing concern over aquatic pollution because of its detrimental effects on biological life including human beings. Herbicide residues lead to a potential risk for aquatic plants that are extremely toxic to the aquatic ecosystem. In our study, the acute toxicity of pretilachlor was studied on *Danio rerio* (zebrafish) as a model organism. The fishes were exposed to different concentrations of pretilachlor to determine the LC_{50}. With 96 hours of toxicity tests, we found that 4.5µl/L concentration was sufficient enough to attain 100% mortality while 3µl/L acted as a threshold level where no mortality was seen. Lastly, to assess herbicide induced DNA damage we had also performed comet assay and micronuclei assay.

Keywords: Pretilachor,Herbicide,Zebrafish

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P9

HARNESSING MICROBIAL FUEL CELLS WITH POLYMER NANO-COMPOSITES FOR INTEGRATED ENVIRONMENTAL SOLUTION

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Abstract:

The increasing demand for energy coupled with the rising volume of wastewater generated due to rapid population growth and urbanization has created serious environmental and resource management challenges. Dependence on fossil fuels continues to contribute to energy insecurity and environmental pollution, while untreated wastewater discharge disrupts aquatic ecosystems. These concerns highlight the need for sustainable technologies that can simultaneously address energy generation and wastewater treatment. Microbial Fuel Cells (MFCs) have gained attention as an eco-friendly approach capable of converting organic matter in wastewater into electrical energy through microbial activity. A critical component influencing the performance of MFCs is the proton exchange membrane, which controls proton transport, oxygen permeability, chemical stability, and resistance to biofouling. Although commercial membranes such as Nafion exhibit excellent proton conductivity, their high cost and environmental limitations restrict large-scale implementation. Sulphonated Poly (ether ether ketone) (SPEEK) has emerged as a potential alternative due to its favorable mechanical properties, thermal stability, and sustainable processing. However, its relatively lower proton conductivity and vulnerability to microbial fouling limit its efficiency in MFC systems. To address these limitations, the development of SPEEK-based nanocomposite membranes has been explored. Zinc Oxide (ZnO) nanoparticles offer antimicrobial properties, high chemical stability, and enhanced ionic conduction due to their large surface area. Incorporation of ZnO nanoparticles into SPEEK improves proton transport, reduces oxygen crossover, and enhances antifouling behavior. The SPEEK-ZnO nanocomposite membrane therefore represents a promising, cost-effective, and environmentally sustainable material for improving MFC performance, contributing to efficient energy recovery and wastewater treatment.

Keywords: Microbial Fuel Cell, Wastewater Treatment, Proton Exchange Membrane, SPEEK, Zinc Oxide Nanocomposite, Sustainable Energy

If you think the economy is more important than the environment, try holding your breath while you count your money – Guy McPherson

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P10

Allium cepa AS A BIOINDICATOR FOR CYTOTOXICITY AND GENOTOXICITY EVALUTION OF WASTEWATER POLLUTION IN RIVER ECOSYSTEM

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Abstract:

Urban rivers are increasingly threatened by pollution from industrial, domestic, and urban runoff sources. This study assessed the cytogenotoxic effects of water and sediment samples from the Adyar River, Chennai, using the Allium cepa root tip bioassay, supported by physicochemical analysis and GC–MS profiling. Samples were collected from upstream (Manappakkam), industrial midstream (Saidapet), and downstream (Adyar Broken Bridge) sites, with tap water as the control.

Cytotoxicity and genotoxicity were evaluated through root growth inhibition, mitotic index, and chromosomal aberrations. Physicochemical parameters (pH and TDS) were measured, and organic contaminants were identified using GC–MS. All river samples showed a significant reduction in mitotic index and increased chromosomal abnormalities compared to the control, indicating strong cytogenotoxic effects. GC–MS analysis revealed the presence of siloxanes, phenolic compounds, fatty acids, and industrial solvents, suggesting mixed urban and industrial contamination.

The findings confirm that the Adyar River is subjected to considerable cytogenotoxic stress and demonstrate the effectiveness of the Allium cepa assay as a sensitive biomonitoring tool for assessing urban river pollution.

Keywords: Allium cepa bioassay, Cytogenotoxicity, Urban river pollution, Chromosomal aberrations, GC–MS profiling, Mitotic index

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P11

EXPLORING THE SYNERGISTIC POTENTIAL OF SORAFENIB AND CURCUMIN IN STAGE-3 HEPATOCELLULAR CARCINOMA THROUGH MODULATION OF HSP90α & TRAP1 PATHWAY

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Abstract:

Hepatocellular Carcinoma (HCC), a primary liver cancer remains a major cause for cancer mortality. According to WHO's International Agency for Research on Cancer (IARC) GLOBOCAN 2022 estimates, liver cancer is identified as a high-fatality malignancy with about 758,725 deaths and 866,000 new cases worldwide. IARC projection indicates that annual deaths could approach 1.3 million by 2040. Although, Sorafenib is a first-line systemic therapy for advanced HCC, its benefit is often modest and short-lived as adaptive resistance and recurrence emerge and even toxicities including hand-foot skin reaction, diarrhoea and hypertension commonly necessitate dose interruption or reduction. To mitigate this gap, we propose a novel biotechnology-driven solution of chaperone-centric sensitization strategy that targets the ATP-dependent defence axis formed by cytosolic HSP90α (HSP90AA1) and its mitochondrial paralogue TRAP1. HSP90α stabilizes multiple oncogenic client proteins including RAF, AKT and HIF-1α sustaining proliferative and stress-adaptive signalling while TRAP1 preserves Mitochondrial proteostasis and metabolic plasticity, buffering oxidative injury and suppressing apoptosis under drug's pressure. Curcumin, a natural polyphenol derived from *Curcuma longa* is proposed to occupy the conserved ATP-binding pockets of HSP90α and TRAP1, thereby dismantling this dual chaperone defence network and restores mitochondrial vulnerability which ultimately amplifies sorafenib-induced oxidative stress and Apoptotic commitment. Geldanamycin, a potent HSP90α inhibitor will be used as a reference to benchmark client proteins destabilization and pathway suppression. Our innovation aims to deliver a clear validated mechanistic model and a scalable adjuvant concept aligned with UN SDG3 and SDG12 to improve sorafenib responsiveness in HCC.

Keywords: HCC, HSP90α–TRAP1 chaperone axis, Sorafenib, Curcumin, Geldanamycin.

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P12

NANO-ENCAPSULATED PHYLLANTHIN AS A DUAL HSP90α AND TRAP1 MODULATOR FOR TARGETED GLIOBLASTOMA THERAPY

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Abstract:

Glioblastoma multiforme (GBM) accounts for nearly 50% of malignant brain tumours and has a median survival of less than 15 months. The standard chemotherapeutic agent temozolomide (TMZ) is limited by MGMT and chaperone-mediated resistance, along with toxicities such as bone marrow suppression and hepatotoxicity. Molecular chaperones, including Heat Shock Protein 90 (HSP90) and its mitochondrial counterpart TRAP1, play a central role in GBM progression by stabilising oncogenic proteins (RAF, AKT and HIF-1α) and suppressing apoptosis. However, conventional HSP90 inhibitors such as geldanamycin and novobiocin are hindered by systemic toxicity and poor blood-brain barrier penetration. To overcome this limitation, **phyllanthin**, a natural lignan from *Phyllanthus niruri*, will be investigated as a targeted chaperone inhibitor, the first study to evaluate phyllanthin-mediated HSP90α and TRAP1 inhibition in TMZ-resistant GBM. To enhance precise delivery, phyllanthin was encapsulated into biocompatible chitosan nanoparticles using ionic gelation, enabling controlled release and improved intracellular uptake with a focus on mitochondrial delivery to modulate TRAP1. The therapeutic efficacy of nano-phyllanthin will be evaluated in TMZ-resistant GBM cell lines to confirm TMZ sensitisation upon chaperone inhibition. *In-silico* predictions and *in-vitro* assays, such as cell viability, apoptosis, ROS generation, and HSP90α/TRAP1 expression, will be assessed and correlated to validate its anti-GBM potential. This work supports SDG 3 (Good Health and Well-Being) and aligns with India's AYUSH initiative by advancing a sustainable, evidence-based, plant-derived nano-therapy for cancer care.

Keywords: Glioblastoma Multiforme, Phyllanthin, HSP90α/TRAP1 inhibition, Chitosan nanoparticles, Mitochondrial targeting

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P13

MOLECULAR RESPONSES TO LOW-DOSE IONIZING RADIATION INDUCED BY CT IMAGING

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Abstract:

Ionizing radiation from Computed Tomography (CT) is an unavoidable component of medical imaging, yet the biological effects of low-dose exposure remain difficult to assess. The present study is aimed to investigate molecular responses to CT-associated low-dose radiation using combined wet-lab and bioinformatics approaches. Peripheral whole blood samples were collected from 50 study subjects 22 males and 28 females .The mean age of the study participants was 50.8 ± 13.5 years) (pre and post Contrast-Enhanced Computed Tomography (CECT) procedure. The mean dose–length product (DLP) across all CT examinations was 2523.7 ± 1291.5 mGy·cm, indicating substantial inter-scan variability. Radiation-induced molecular responses were evaluated through expression analysis of DNA damage–responsive genes. In parallel, an integrated bioinformatics analysis was performed using DAVID for functional enrichment, STRING and Cytoscape for protein–protein interaction network construction, and ENCODE ChIP-seq data for transcription factor–gene regulatory network analysis. Gene Expression analysis demonstrated altered levels of key DNA damage response genes like *DDB2* and GADD45A in samples post CT Procedure with inter-individual variability. Bioinformatics analysis revealed significant enrichment of DNA damage response and p53 signalling pathways ($P = 8.15 \times 10^{-8}$). Network analysis identified TP53 as the central regulatory hub, with *CDKN1A, GADD45A, DDB2*, and *BTG2* acting as major secondary regulators. The combined wet-lab and bioinformatics findings demonstrate that low-dose radiation from CT imaging induces measurable molecular alterations in peripheral blood cells. These findings provide mechanistic insight into low-dose radiation effects and support the use of molecular responses as indicators for radiation exposure assessment.

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P14

ANTICANCER POTENTIAL OF L-ASPARAGINASE FROM *Curvularia* SP. LCJ413 AGAINST HUMAN LUNG CANCER CELLS (A549)

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Abstract:

L-Asparaginase is a well-known anticancer enzyme widely used in the treatment of acute lymphoblastic leukemia. In the present study, L-Asparaginase was isolated and purified from *Curvularia* sp. and evaluated for its cytotoxic and apoptotic potential against the human lung cancer cell line (A549). The partially purified enzyme was tested at different concentrations for 24 h using the MTT assay. A dose-dependent reduction in cell viability was observed. The half-maximal inhibitory concentration (IC_{50}) of the enzyme was determined to be 75 µg/mL and was selected for further studies. At this concentration, A549 cells displayed characteristic morphological alterations, including shrinkage, detachment, loss of adhesion, and cytoplasmic membrane blebbing under a phase-contrast microscope. Apoptosis was confirmed by acridine orange/ethidium bromide (AO/EtBr) dual staining. Control cells exhibited uniform green fluorescence, whereas treated cells displayed early apoptotic features with green and yellow fluorescence and late apoptosis with orange to red fluorescence, indicating nuclear fragmentation and membrane damage. These results demonstrate that L-Asparaginase derived from *Curvularia* sp. possesses potent anticancer activity by inducing apoptosis in lung cancer cells, suggesting its potential as a promising therapeutic agent.

Keywords: Endophytic fungi, *Curvularia* sp. LCJ413, MTT assay, Lung cancer cell line, Apoptosis

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P15

IN SILICO SCREENING OF PLANT-BASED ANTIFUNGAL COMPOUNDS TARGETING LANOSTEROL 14-ALPHA DEMETHYLASE FOR SUSTAINABLE MANAGEMENT OF TINEA PEDIS

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Abstract:

Tinia Pedis (commonly known as athlete's foot) is a common fungal infection caused due to a fungi *Trichophyton rubrum* and is treated using azole-based antifungal drugs that inhibit lanosterol 14-alpha demethylase (ERG11), which is a key enzyme in ergosterol biosynthesis which is much needed for the fungi's survival in human skin. While being used as treatment, repeated topical application and wash-off of these synthetic antifungals raise sustainability concerns due to their limited biodegradability and potential contribution to pharmaceutical contamination in water. This study aims to explore sustainable, plant based antifungal alternatives using a bioinformatics driven-approach. Lancosterol 14-alpha demethylase will be selected as the target protein due to its role in fungal cell membrane integrity. Phytochemicals can be derived from *Azadirachta indica* with reported antifungal properties and can be subjected to molecular docking using docking tools to predict their binding affinity and interaction patterns with the protein. The phytochemicals which have the best score can be compared with those of the azole anti-fungal drugs. The In silico ADMET analysis will be performed to evaluate the drug likeness and toxicity profiles and the environmental fate and biodegradability parameters will be assessed using the EPA's EPI Suite to examine the sustainability aspect of the proposed compounds. This study is expected to identify potential plant-derived antifungal candidates and integrate molecular docking and environmental risk assessment highlighting the role of bioinformatics in supporting sustainable drug discovery for fungal skin infections.

Keywords: Tinea pedis, Lanosterol 14-alpha demethylase, Molecular docking, Phytochemicals, Sustainable medicine, Bioinformatics.

ONLINE ORAL PRESENTATIONS

What is the good of your stars and trees, your sunrise and the wind, if they do not enter into our daily lives? –E.M. Forster

SUSTAINABILITY IN AGRICULTURE & FOOD

(OV-A1 – OV-A9 & OV-F1 – OV-F5)

If agriculture goes wrong, nothing else will have a chance to go right." — M.S. Swaminathan

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OV-A1

MORPHO-BIOCHEMICAL CHARACTERIZATION AND UTILIZATION OF POTENTIAL GENETIC RESOURCES FOR SUSTAINABLE CASHEW NUT PRODUCTION

Siddanna Savadi*[1], Manju Manuel[1], Kalirajan G.[1], Asma Raffi[1], Mohana G. S.[1], J. D. Adiga[1], Muralidhara B.M.[2], Manjunatha K.[1]

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Abstract:

Cashew is an important export-oriented crop and playing great role in India's agro-economy. However, nearly half of raw cashew nuts are imported due to low productivity. Identification and characterization of promising germplasm accessions for economically important traits would be useful for genetic improvement of cashew to improve the productivity and sustainable cashew nut production in the country. In the current study, the fifty-five cashew germplasm accessions conserved at National Geene Field Bank, ICAR-Directorate of Cashew Research (DCR), Puttur were evaluated for morphological and biochemical traits. The studied accessions showed significant variability for nut and cashew apple traits, suggesting their importance as a genetic resource for cashew tree improvement. Nut weight of the studied accessions varied from 3.69 g (NRC392) to 14.59 g (NRC383). Shelling percentage varied between 22.32% (NRC335) and 36.37% (NRC236). Cashew apple weight ranged from 27.24 g (NRC392) to 149.58 g (NRC301). Accessions: NRC364, NRC383, NRC385, H130, NRC577, and NRC580 showed superior nut size (>12 g), indicating their potential as donor parents in breeding programmes aiming at improving the nut size trait. Biochemical analysis of the accessions showed wide variability for Cashew Nut Shell Liquid (CNSL) content (0% to 42.63%) and kernel oil (CKO) content (22.33% to 55.24%). These findings suggest the wide variability in the CNSL and CKO contents of the evaluated germplasm, which provide great opportunities for improving these economically important traits. Thus, utility of unique germplasm identified in this study in cashew breeding programmes can enhance productivity and high-value traits in a sustainable manner. Besides, the study contributes towards making informed decisions in conservation of unique cashew germplasm accessions.

Keywords: Germplasm, Breeding, Sustainable, CNSL, Export, Cashew apple

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OV-A2

ENGINEERING THE MALYL-COA-GLYCERATE CYCLE IN *Brassica* SP., A SYNTHETIC BIOLOGY APPROACH FOR ENHANCED CARBON FIXATION AND ACETYL-COA BIOSYNTHESIS

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Abstract

The fixation of carbon dioxide in plants predominantly occurs via the Calvin-Benson-Bassham (CBB) cycle, which drives carbohydrate synthesis and biomass accumulation. However, its efficiency is limited, due to photorespiration and the downstream production of acetyl-CoA, a key precursor for the biosynthesis of lipids and amino acids. Recent advancements in synthetic biology have introduced the Malyl-CoA-Glycerate (McG) cycle as a complementary pathway to enhance CO_2 fixation. Recent studies in *Arabidopsis thaliana* demonstrated that the expression of six heterologous enzymes [PPC, MTK, MCL, GCL, TSR, GDH] in chloroplasts significantly improves carbon fixation and acetyl-CoA production while also augmenting biomass yield (Lu et al., in revision). This study aims to extend the application of the McG cycle to *Brassica napus* (Rapeseed), the third largest source of vegetable oil worldwide, where it also serves as a key feedstock for biodiesel production and as a lubricant, extending its industrial applications. The study will entail transformations, screening of transformants, and comprehensive analysis of physiological and metabolic changes. Successful transformants are expected to exhibit enhanced carboxylation rates, lipid biosynthesis, and improved overall biomass production. This study represents a novel strategy for boosting crop yields and resilience by reprogramming carbon fixation and eliminating carbon loss during the acetyl-CoA production, providing broad implications for sustainable agriculture.

Keywords: Carbon Fixation, CBB Cycle, McG Pathway, Acetyl-CoA Production, Brassica Napus, Chromosome, Genome, and Synthetic biology

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OV-A3

SMART AND SUSTAINABLE AGRICULTURE: A REVIEW OF PRACTICES, TECHNOLOGIES AND FUTURE PROSPECTS

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Abstract

Sustainable agriculture has emerged as a crucial strategy for meeting the increasing global demand for food while preserving environmental integrity and ensuring economic viability for farmers. Although conventional agricultural practices have achieved high productivity, they have also contributed to soil degradation, water scarcity, biodiversity loss, and rising greenhouse gas emissions. Sustainable agriculture addresses these challenges by integrating ecological principles, modern technologies and socio-economic considerations to develop resilient and resource-efficient farming systems. This review presents the core concepts, major practices, technological interventions, benefits, challenges and future prospects of sustainable agriculture. It highlights the roles of precision farming, organic agriculture, renewable energy utilization and smart irrigation systems in promoting sustainability. The review concludes that sustainable agriculture is essential for achieving food security, environmental protection and long-term agricultural development.

Keywords: Sustainable agriculture, precision farming, organic farming, climate resilience, resource management

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OV-A4

LEAD PRESENCE IN MARKET TURMERIC: AN EDAX-BASED STUDY

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Abstract:

Concerns over lead contamination in turmeric have increased in recent years due to its widespread consumption and potential health risks. In this work, commercially available turmeric samples were examined for the presence of lead using Energy Dispersive X-ray Analysis (EDAX) attached to a Scanning Electron Microscope. Elemental analysis confirmed the presence of lead in all the turmeric samples analysed, indicating widespread contamination across the tested sources. SEM images supported the elemental findings by indicating the association of lead with inorganic particulate matter. The study demonstrates that EDAX serves as a simple and effective tool for the preliminary identification of heavy metal contamination in turmeric and highlights the need for regular quality assessment of spices available in the market.

Keywords: Curcumin, Lead, EDAX, SEM, Contamination

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OV-A5

EFFECT OF *Azotobacter,* FRUIT AND VEGETABLE WASTE AS A BIO FERTILIZER IN ENHANCING PLANT PRODUCTIVITY

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Abstract:

The present study was carried out to evaluate the effects of ***Azotabacter*** and liquid bio fertilizer prepared from fruit and vegetable waste on plant growth and productivity. ***Azotobacter***, a free-living nitrogen-fixing biofertilizer, was mixed with soil in appropriate propotions and allowed to stabilize for one day prior to sowing. Seed treatment was perfomed by dissolving the 1g of ***Azotobacter*** Bio Fertilizer in 10m, required after which the seeds were soaked and shade-dried before sowing. Germination was observed from the third day onwards, and the germination percentage was recorded. After 7-10 days of growth, a liquid biofertilizer prepared from fermented fruits and vegetable waste was applied to the plants. The waste material were crushed, mixed with Distilled water, and allowed to ferment under sunlight without disturbance until color changes were observed, indicating bio-decomposition and nutrient release. The effectiveness of the treatments was assessed by analyzing germination percentage, shoot length, root length, plant height, and overall growth performance over a period of ten days. The Results demonstrated that the combined application of *Azotobacter* and fruit-vegetable waste-based biofertilizer significantly enhanced plant growth and productivity, suggesting an eco-friendly, cost-effective, and sustainable alternative to chemical fertilizers.

Key Words: *Azotobacter,* Concentration (Peels of Onion, Egg shell, Banana Peels)

Water and air, the two essential fluids on which all life depends, have become global garbage cans – Jacques Cousteau

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OV-A6

UTILIZING STATE-OF-THE-ART CELL CULTURE OF TISSUE METHODOLOGIES TO OPTIMIZE THE POTENTIAL OF *Amorphophallus paeoniifolius*

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Abstract:

Amorphophallus paeoniifolius is an annual herbal remedy that has gained popularity for its nutritional, therapeutic, and economic applications. It is an important driver of the fiber glucomannan, an assortment of polysaccharide that has several economic uses which is indigenous to the southeast region of Asia. The species' enormous value is currently underestimated due to subpar rearing and growing practices. Due to its high content of nutritional fiber, amino acids, or building blocks, and carbohydrates, the corm of this particular species represents an effective source of nourishment. It has historically been utilized for managing a variety of ailments, including heart issues, immune-mediated conditions, and insulin resistance. Glucose has unique properties that make it useful in the food, pharmaceutical, and cos chmetic industries.Tissue culturing technique is one potential means of enormous proliferation and survivability. The callus formation cultivation, minuscule dissemination, and development of embryos from autologous cell may been successfully employed to produce superior spawning substrate. The expansion of plants hormones, tissue construction, and environmental factors all have an influence on the tissue. Appropriate tissue culture techniques that promote expansion and maintenance can make mass production easier. Genetic engineering and breeding programs can boost yield, susceptibility to diseases, and glucomannan composition. This species of *Amorphophallus paeoniifolius* is a useful species with a lot of potential. By offering a method of preservation and worldwide reproduction, tissue culturing innovation supports ecologically responsible use. This synopsis discusses tissue culture techniques, emphasizes the importance of *A. paeoniifolius*, and provides details about its potential applications.

Keywords: Conservation, *Amorphophallus paeoniifolius*, glucomannan, tissue culture, micropropagation, industrial application.

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OV-A7

DUNG BEETLES (COLEOPTERA: SCARABAEIDAE) AND THEIR ROLE IN ENHANCING SOIL HEALTH AND SUSTAINABLE AGRICULTURE AROUND KEETHAM LAKE, AGRA

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Abstract:

Dung beetles are flying insects, belonging to subclass Pterygota, order Coleoptera and family Scarabaeidae. Dung beetles are ecologically significant insects that play a vital role in nutrient recycling, soil aeration, organic matter decomposition, and ecosystem sustainability. The present study investigates the diversity, distribution, and ecological importance of dung beetles at Keetham Lake, Agra, a prominent wetland ecosystem of northern India. Systematic field surveys were conducted across different habitats, including grasslands, agricultural fields, forest patches, and wetland margins, using standardized sampling methods. A total of several species belonging to multiple genera were recorded, representing a considerable diversity of dung beetles in the study area. The observed variations in species composition and abundance were closely associated with habitat type, availability of dung resources, and seasonal fluctuations. The findings highlight the significant role of dung beetles in maintaining ecological balance, enhancing soil fertility, and supporting sustainable agriculture. Furthermore, the study contributes baseline data essential for biodiversity monitoring, wetland conservation, and environmental planning. By promoting ecosystem-based management, digital biodiversity documentation, and sustainable conservation strategies, this research aligns with the national vision of *Viksit Bharat @2047*, emphasizing environmental sustainability, ecological resilience, and informed policy development for a technologically empowered and environmentally responsible India.

Keywords: Dung beetles, Scarabaeidae, vital role, Biodiversity, Chemoreceptors, Sustainable Agriculture

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OV-A8

FOOD BIOTECHNOLOGY FOR SUSTAINABLE AGRICULTURAL AND NUTRITIONAL INNOVATIONS: A SYSTEMATIC REVIEW

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Abstract:

Food biotechnology has emerged as a pivotal tool for advancing sustainable agriculture and improving nutritional quality, addressing critical challenges of food security and resource management. This systematic review synthesizes recent research on biotechnological interventions, including genetically modified (GM) crops, biofortification, microbial fermentation, probiotics, and alternative protein platforms, focusing on their efficacy, scalability, and environmental impact. Evidence indicates that GM and biofortified crops enhance yield stability and micronutrient content, while microbial fermentation and probiotic-based functional foods contribute to health promotion and dietary diversification. Emerging protein technologies, such as cultured meat and plant-based analogs, offer significant potential for reducing greenhouse gas emissions and optimizing resource utilization. Despite these advancements, constraints such as regulatory compliance, biosafety considerations, consumer perception, and limited translational studies in the Indian context hinder large-scale adoption. The review identifies research gaps in techno-economic evaluations, lifecycle analyses, and the integration of these innovations into sustainable food systems. Strategic implementation of food biotechnologies can facilitate resource-efficient, nutritionally enriched, and environmentally sustainable agricultural practices, contributing to improved food security and public health outcomes. This synthesis underscores the role of evidence-based biotechnological innovations in promoting sustainable development, guiding policy formulation, and supporting the modernization of India's agricultural and food sectors.

Keywords: Food biotechnology, Sustainable agriculture, Biofortification, GM crops, Probiotics, Functional foods

There is no such thing as 'away' When we throw anything away it must go somewhere – Annie Leonard

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OV-A9

GREEN-SYNTHESISED SELENIUM NANOPARTICLES DOSE-DEPENDENT UPTAKE AND STRESS-RESPONSIVE EFFECTS IN RADISH PLANTS

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Abstract

Micronutrient malnutrition and climate-induced agricultural stress remain critical challenges to global food security, particularly in selenium-deficient regions where nearly one billion people are affected. Conventional fertilization practices often rely on chemically intensive inputs, raising environmental and sustainability concerns. Addressing these issues in alignment with the United Nations Sustainable Development Goals (SDG 2: Zero Hunger and SDG 13: Climate Action), this study presents a sustainable nano-enabled biofortification strategy using green-synthesised selenium nanoparticles. Quercetin-capped selenium nanoparticles (QSeNPs) were synthesised using quercetin, a natural plant flavonoid, serving as both reducing and stabilizing agent. Comprehensive physicochemical characterization (FTIR, DLS, zeta potential, SEM, TEM, and XRD) confirmed the formation of stable, spherical, crystalline nanoparticles with improved dispersion and reduced toxicity. The biological efficacy of QSeNPs was evaluated in radish (*Raphanus sativus* L.), a nutritionally important Brassicaceae crop, under controlled conditions. QSeNP application resulted in clear dose-dependent physiological and molecular responses. Low concentrations supported near-normal growth, enhanced antioxidant capacity, and upregulated stress-responsive gene expression, indicating improved stress tolerance. In contrast, higher concentrations induced phytotoxic effects, including reduced root–shoot elongation and chlorosis. ICP-OES analysis revealed preferential selenium accumulation in roots with limited translocation to leaves, suggesting controlled uptake and tissue-specific partitioning. Importantly, optimised QSeNP treatments enhanced the biosynthesis of health-promoting secondary metabolites, including glucosinolates and phenolic compounds, thereby improving both crop resilience and nutritional quality. Overall, the findings demonstrate that green-synthesised selenium nanoparticles offer a scalable, low-toxicity, and environmentally responsible approach to crop biofortification, contributing to sustainable agriculture, climate resilience, and improved nutritional security.

Keywords: Selenium nanoparticles, Green synthesis, Biofortification, Radish (*Raphanus sativus*), Antioxidant signalling, Glucosinolates, Gene expression.

The world will not be destroyed by those who do evil, but by those who watch and do nothing – Albert Einstein

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OV-F1

DESIGN OF A PORTABLE SUSTAINABLE COOL CHAMBER WITH SOLAR DRIVEN ABSORPTION REFRIGERATOR FOR FRUITS AND VEGETABLE STORAGE

Akshaya Nair[1*], Benhur Jones[1], Olivia Sajeev[1], Vidhu Krishnan[1], Girilal M[1]

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Abstract:

The increasing post-harvest losses of fruits and vegetables, especially in rural and off-grid regions, highlight the urgent need for affordable and eco-friendly cooling solutions. The project focuses on the design and development of a sustainable cool chamber integrated with a solar-driven absorption refrigeration system for the efficient storage of perishable agricultural produce. The system utilizes solar energy as the primary power source, ensuring zero operational emissions, minimal environmental impact and very low running costs. The chamber structure is fabricated using a steel frame for mechanical strength and durability, while clay slabs are used for their natural insulation and evaporative cooling properties to maintaining a stable low temperature environment ideal for fresh produce. A Peltier device is employed to generate the necessary temperature difference for active cooling, assisted by a DC fan for uniform air circulation throughout the chamber. The electrical system is powered through a solar panel and solar module, with energy stored in a lithium-ion battery to ensure continuous operation during non-sunlight hours. A design acrylic sheet serves as a transparent and lightweight material for the chamber enclosure, allowing visibility while maintaining temperature control and making them portable. The design aims to combine renewable energy utilization, low-cost materials, and sustainable refrigeration technology to extend the shelf life of fruits and vegetables without reliance on grid electricity. This innovative approach not only reduces post-harvest losses but also promotes energy efficiency, environmental sustainability, and rural livelihood enhancement.

Keywords: Solar refrigeration, Sustainable cooling, Absorption refrigeration, Renewable energy, Zero-energy cool chamber.

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OV-F2

CITRUS CARBON DOT COATING ON TOMATO TO IMPROVE THE SHELF LIFE

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[2]Department of Botany, Bharathiar University, Coimbatore, Tamil Nadu

Abstract:

Tomato is a highly consumed vegetable but suffers from rapid ripening and postharvest losses up to 42%. Conventional preservation methods like chlorine washing are limited and raise safety concerns. This project proposes a sustainable solution using carbon dots (CDs) synthesized from citrus fruit as a novel edible coating to extend tomato shelf life. Carbon dots, produced through a green synthesis from citrus juice and pulp, possess low toxicity, biocompatibility, antioxidant, and antimicrobial properties. Their unique ability to interact with ethylene gas helps delay ripening and maintain fruit quality. In this study, CDs were be characterized using UV-Vis spectroscopy, FTIR, XRD, TEM, and SEM, and prepared as a solution for coating tomatoes. The coated tomatoes were analyzed for vitamins, antioxidants, phenolics, moisture, and pH compared with uncoated samples. This approach is expected to reduce food waste, enhance storage life, and promote value addition to citrus waste for sustainable agricultural applications.

Key words: Tomato, Shelf life, Carbon dots, Value addition

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OV-F3

DEVELOPMENT OF EPS-BASED PROBIOTIC PROPERTIES OF BIOFILM-FORMING NOVEL MICROBIAL ISOLATE FOR FOOD APPLICATIONS

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Abstract:

Exopolysaccharide-producing lactic acid bacteria represent a promising biological approach for developing functional biofilms aimed at improving food quality and shelf life. The present work reports the development of an EPS-based probiotic biofilm derived from the biofilm-forming lactic acid bacteria for food preservation applications. LAB were isolated from yogurt samples and screened by Gram staining, catalase, oxidase, and sucrose fermentation tests to select efficient EPS-producing strains. The selected isolates showing high yield of EPS were further characterized and the extracted EPS was analysed by FTIR, which confirmed the presence of a characteristic polysaccharide functional group essential for the formation of a biofilm. The LAB-derived EPS was incorporated into a composite matrix of corn starch, chitosan, and sodium alginate to formulate the biodegradable edible biofilm. The physicochemical and functional properties of the developed biofilms were assessed for moisture content, density, antioxidant activity, and biodegradability. The results showed that EPS-based probiotic biofilms demonstrated increased antioxidant capacity, appropriate moisture retention, and good biodegradation behaviour. In the present study, a model system of sapodilla fruit was used to determine the practical applicability of biofilm. Fruits coated with the biofilm showed delayed ripening, reduced spoilage, and improved visual quality during storage. The results are indicative of emerging trends in food preservation and edible packaging, where natural sustainable alternatives comprising EPS-producing probiotic LAB have been investigated.

Keywords: Exopolysaccharide, Biofilm, Probiotics, Food preservation, Antioxidant, Biodegradable.

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OV-F4

KEFIR PRODUCTION USING COCONUT MILK AND TASTE ENHANCEMENT

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Abstract:

This project explores the potential health benefits of coconut milk kefir, a fermented dairy-free product that has recently gained popularity due to its potential probiotic effects. Nutritional analysis of the product, as well as a survey of existing research on its potential benefits, is been conducted. There is no patent available on coconut milk kefir. We examined the potential role of coconut milk kefir in improving digestive health, boosting immunity, and reducing inflammation. Additionally, the safety and efficacy of the product has been evaluated, and potential side effects will be discussed. The results of the project provide insight into the potential benefits of coconut milk kefir and support the use of the product as a probiotic supplement. Kefir is a traditional fermented dairy food, but when made with coconut milk, it provides a vegan-friendly probiotic alternative. In this project, the coconut milk kefir flavouring was done and how the flavouring affects the probiotic content of the beverage was seen. First, a range of coconut milk kefir was developed and tested to determine the optimal ratio of ingredients for a successful fermentation. Next, flavorings were done using Ice Apple, Mint-lime and coffee to the coconut milk kefir to create a variety of flavours.

Keywords: Coconut milk kefir, Probiotics, Fermentation, Dairy-free functional food, Gut health, Flavor optimization

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OV-F5

COMPARATIVE CHARACTERIZATION OF CURD-DERIVED *Bacillus coagulans* AND *Bacillus clausii* AS ROBUST PROBIOTIC CANDIDATES

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Abstract:

Traditional fermented foods are valuable reservoirs of robust probiotic microorganisms. In the present study, curd was explored as a natural source for isolating spore-forming probiotic bacteria with enhanced survivability. Two *Bacillus* isolates were obtained from curd samples following heat treatment and selective cultivation. Morphological, microscopic, and biochemical characterization, supported by 16S rRNA gene sequencing, identified the isolates as *Bacillus coagulans* (99.2% similarity) and *Bacillus clausii* (99.5% similarity). Both isolates exhibited key probiotic attributes in accordance with FAO/WHO guidelines. Acid tolerance assays revealed that *Bacillus coagulans* demonstrated superior survivability at low pH, retaining 80.3% viability at pH 3.0, while *Bacillus clausii* showed 70.6% survival. In contrast, *Bacillus clausii* exhibited greater bile salt tolerance, maintaining growth at bile concentrations up to 1%. Both isolates displayed significant antagonistic activity against common enteric pathogens, including *Escherichia coli*, *Salmonella typhi*, and *Staphylococcus aureus*, indicating strong antimicrobial potential. High spore-forming efficiency was observed, particularly in *Bacillus coagulans* (83.9%), confirming their resilience to adverse environmental conditions. Additionally, both strains produced extracellular digestive enzymes such as amylase, protease, and lipase, highlighting their functional role in nutrient assimilation. Overall, the findings demonstrate that curd-derived *Bacillus coagulans* and *Bacillus clausii* possess complementary probiotic traits, combining acid resistance, bile tolerance, antimicrobial activity, enzymatic potential, and spore-forming capacity. These indigenous strains represent promising candidates for incorporation into functional foods, dietary supplements, and food biotechnology applications.

Keywords: Probiotics, *Bacillus coagulans*, *Bacillus clausii*, Antimicrobial activity, Food Biotechnology

ENVIRONMENTAL & INDUSTRIAL SOLUTIONS THROUGH BIOTECHNOLOGY

(OV-E1 – OV-E6 & OV-IB1 – OV-IB4)

Biotechnology is the key to solving many of the world's most pressing problems, from food security to climate change to disease — Bill Gates

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OV-E1

ALGAL BIOFACTORIES FOR GREEN HYDROGEN, BIOFUELS, AND HIGH-VALUE METABOLITES: ADVANCING A BIOECONOMY-BASED VIKSIT BHARAT

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Abstract

Algal biofactories represent a scalable and transformative approach to renewable energy generation and biomanufacturing, directly supporting the strategic objectives of India's Viksit Bharat Vision. Unlike terrestrial oil crops, microalgae offer superior photosynthetic efficiency without competing for arable land, achieving theoretical biomass yields of ~280 t/ha per year, and oil outputs ranging from 19,000 to 57,000 L per acre annually. With lipid contents typically between 20-50% of dry weight scalable to 80% under optimized stress conditions, microalgae provide a robust feedstock for biodiesel and photobiological hydrogen production. This study highlights the techno-economic potential of integrated algal biorefineries utilizing wastewater-based cultivation. This dual-purpose framework facilitates the simultaneous remediation of nutrients and the production of high-value metabolites, including carotenoids, polysaccharides, and antioxidants. Furthermore, advanced hydrothermal liquefaction of wastewater-derived biomass is shown to yield bio-oil with heating values up to ~38 MJ/kg, reinforcing the feasibility of a circular bioeconomy. We conclude that coordinated advancements in strain engineering, cultivation optimization, and scalable bioprocess design are critical for deploying algal biofactories as a cornerstone of national energy security and sustainable industrial growth.

Keywords: Microalgae, Biohydrogen, Biofuels, High-Value Metabolites, Algal Biorefinery, Sustainable Bioeconomy.

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OV-E2

GENERATION OF BIOELECTRICITY FROM TEXTILE EFFLUENT USING MICROBIAL FUEL CELL

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Abstract:

The increasing challenges of water contamination and the shortage of energy supplies threaten human health and global stability. Addressing these problems requires renewable energy development that can promote to clean energy while preserving water resources. Microbial fuel cells (MFCs) provide a promising technology as they can purify wastewater and generate electricity simultaneously. This study focuses on the feasibility of using bacterial cultures to produce bioelectricity from textile effluent. This study achieved a maximum voltage of 400 mV. The MFCs system successfully removed up to 60% of Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) from textile effluent. The bioelectricity produced can be utilized during emergencies such as floods, droughts, storms or extreme summer conditions when the conventional power supply is disrupted. These findings highlight the potential of MFCs technology as a cost-effective and eco-friendly solution for electricity generation and wastewater treatment in the textile industry, offering significant benefits for both developed and developing countries.

Keywords: Renewable energy, Bioelectricity, Microbial Fuel Cell, Textile effluent, Anode chamber, Cathode chamber

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OV-E3

TURNING AGRO-INDUSTRIAL WASTE INTO VALUE: A SUSTAINABLE ROUTE TO MICROCRYSTALLINE CARBOHYDRATES

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Abstract

Microcrystalline carbohydrate (MCC) is a value-added biopolymer extensively utilized in pharmaceutical, food, cosmetic, and biodegradable material applications because of its high crystallinity, excellent biocompatibility, and notable thermal stability. In this study, a reliable and optimized protocol is presented for the production of MCC from a range of lignocellulosic biomass residues. The process is designed to be reproducible and adaptable to different feedstocks derived from agro-industrial waste. The extraction methodology consists of a sequence of well-defined steps, beginning with biomass pretreatment to remove impurities and enhance cellulose accessibility. This is followed by alkaline delignification to eliminate lignin, bleaching to further purify the cellulose fraction, and controlled acid hydrolysis to selectively remove amorphous regions and generate MCC. Subsequent neutralization, thorough washing, and drying ensure the recovery of a purified and stable MCC product. To address the inherent variability among biomass sources, processing parameters are adjusted based on differences in lignin, hemicellulose, lipid, and silica content, thereby improving yield and product consistency. The structural, morphological, and thermal properties of the extracted MCC are comprehensively evaluated using X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FT-IR), scanning electron microscopy (SEM), and thermogravimetric analysis (TGA). These characterization techniques confirm the successful formation of MCC with desirable crystallinity, surface morphology, and thermal resistance. Overall, the proposed approach demonstrates an efficient and sustainable strategy for transforming lignocellulosic waste into high-quality microcrystalline cellulose. This work supports the valorization of agricultural residues and contributes to the development of sustainable materials within the framework of a circular bioeconomy.

Keywords: Microcrystalline carbohydrate, lignocellulosic biomass, biopolymer, sustainable production, waste valorization.

The more clearly, we can focus our attention on the wonders of the universe, the less taste we shall have for destruction – Rachel Carson

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OV-E4

SUSTAINABLE BIOLOGICAL HYDROGEN GENERATION FROM DOMESTIC WASTEWATER USING A DUAL-CHAMBER MICROBIAL ELECTROLYSIS CELL.

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Abstract:

Microbial electrolysis cells (MECs) are an emerging and cutting-edge method for producing biological hydrogen sustainably from wastewater streams and renewable biomass. Enhancing hydrogen production rates while reducing external energy input, however, continues to be a major obstacle in the development of MEC. Dual-chamber microbial electrolysis cell systems with electrochemical support provides a viable method for producing sustainable and renewable energy. The current study assessed the possibility of using carbohydrate-rich effluents by using residential wastewater as the substrate for biohydrogen generation. In order to increase hydrogen yield, the experimental study concentrated on enriching microorganisms that produce hydrogen and optimising biological process parameters. Different electrode materials, substrate kinds, and bacterial cultures were used to optimise the process. In microbial electrolysis tests utilising household wastewater, organic matter was broken down by electrochemically active bacteria when a low external voltage (>0.2 V) was applied in a specifically made dual-chamber MEC. With an 8.2% hydrogen yield and higher gas production rates, the system showed improved hydrogen generation. Carbon rod anodes combined with titanium plate cathodes performed better than other electrode materials like platinum and stainless steel among the electrode combinations examined. These results demonstrate the potential for effective biohydrogen production from household wastewater using dual-chamber MEC systems combined with optimised electrode materials.

Keywords: Biological hydrogen, Wastewater, anaerobic bacteria, Electrolysis, Hydrogen yield

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OV-E5

STUDIES ON CHRONIC EXPOSURE TO ARSENIC TOXICITY THROUGH FOOD CHAIN CONTAMINATION IN SELECTED SITES OF WEST BENGAL, INDIA AND SEARCH FOR REMEDIAL STRATEGIES

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Abstract:

Groundwater arsenic (As) contamination remains a critical global health crisis, particularly in rural Bengal, where it poses severe carcinogenic risks. This study examines As-affected blocks in North 24 Parganas, West Bengal, revealing that only 25–36% of deep tube-well water meets "good" drinking quality standards. Quantitative estimations place the region's ecological risk in a "very high-risk" class. Beyond drinking water, contaminated rice is a primary exposure pathway, contributing approximately 89.5% of inorganic arsenic (iAs) intake. Research indicates that pre-monsoonal and unpolished rice varieties pose higher health risks than post-monsoonal or polished alternatives. Analysis of biomarkers (urine, hair, and nails) confirms a significant correlation between dietary intake and chronic arsenicosis, with children being particularly vulnerable to sub-chronic exposure. Remediation strategies focused on providing arsenic-safe surface water through slow sand filtration and chemical treatment showed a "note-worthy declining trend" in arsenic accumulation in children after eight months. Furthermore, domestic cooking modifications proved effective: soaking rice for one hour in As-safe water followed by cooking reduced As by 70%. The use of chelating agents (citrate and tartrate) also achieved up to 50% reduction. The study concludes that preventing food chain contamination requires avoiding As-contaminated groundwater for agriculture and cooking, promoting selenium-rich diets, and implementing awareness campaigns to mitigate this devastating public health calamity.

Keywords: Groundwater, Arsenic, Drinking water, Rice grain, Arsenicosis, Remediation strategies

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OV-E6

OSMOREGULATORY ADAPTATIONS AND EFFICIENT REMOVAL OF MULTI-PYRETHROID RESIDUES FROM HYPERSALINE WASTEWATER USING A HALOTOLERANT MICROBIAL ISOLATE

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Abstract:

Sustainable and cost-efficient bioremediation of the pyrethroid pesticide industry wastewater requires the distribution of halotolerant microbial catalysts capable of maintaining metabolic activity under hypersaline conditions. In this study, a strong bacterial isolate was recovered from industrial wastewater and identified as *Enterobacter ludwigii* through biochemical, molecular, and phylogenetic profiling. The biodegradation kinetics of this strain were evaluated using synthetic wastewater matrices containing a consortium of five pyrethroid pesticides across a salinity gradient (1%-10% NaCl) and varying substrate loadings (50-600 mg/L). Under optimized bioprocess parameters specifically 3% NaCl and 100 ppm substrate concentration the strain exhibited superior biomass proliferation modeled by first-order kinetics and achieved biomineralization efficiency exceeding 90% within an 8-day treatment cycle. GC-MS and enzymatic assays elucidated that the catabolic pathway involves a co-metabolism strategy, resulting in complete detoxification without the accumulation of toxic metabolites. Furthermore, NMR and HPLC analyses confirmed that *E.ludwigii* employs a specialized osmoregulatory mechanism, accumulating osmolytes to mitigate osmotic stress. These results highlight the potential of this novel *E. ludwigii* strain as a high-performance bio-agent for the remediation of pesticide-contaminated saline environments.

Keywords: Pyrethroid, Saline Wastewater, Halotolerant, Osmolyte, Biodegradation.

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OV-IB1

EFFECT OF OSMOLYTES IN INCREASING THE ACTIVITY OF PAPAIN ENZYME FOR VARIOUS BIOLOGICAL APPLICATION

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Abstract:

Papain is a widely utilized cysteine protease known for its effectiveness in numerous biological and industrial processes. However, the activity of papain is highly sensitive to external factors such as pH, temperature, and surrounding chemical conditions. Osmolytes are low-molecular-weight compounds that play an important role in maintaining protein stability and enhancing enzyme function under unfavorable conditions. This study examines the influence of various osmolytes on the catalytic activity of papain to improve its performance in biological applications.The activity of papain was assessed in the presence of selected osmolytes, including dimethylglycine (DMG), sorbitol, and sucrose, at different concentrations. Enzyme assays were carried out under controlled pH conditions using glycine–HCl and sodium acetate buffers, and enzyme activity was determined using spectrophotometric methods. The results indicated that specific osmolytes significantly increased papain activity by stabilizing its native structure and reducing denaturation caused by pH and thermal stress. Polyol-based osmolytes, in particular, exhibited a strong protective effect on enzyme functionality.Overall, this study demonstrates that osmolytes can effectively enhance papain activity and stability, offering promising applications in biotechnology, pharmaceutical formulations, and food industries where improved enzyme efficiency is essential.

Keywords: Papain, Osmolytes, Enzyme activity, Protein stabilization, pH and thermal stability, Biological applications

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OV-IB2

SUSTAINABLE OPTIMIZATION OF BIOPOLYMER PRODUCTION FROM AGRO-WASTE

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Abstract

Biopolymers are biodegradable and biocompatible polyesters synthesized by various microorganisms as intracellular reserves of carbon and energy. Owing to their environmentally friendly nature, microbial biopolymers are considered promising alternatives to conventional petroleum-based plastics; however, their large-scale application is limited by high production costs and low yields. As a result, optimization of biopolymer production using low-cost, naturally available substrates has gained increasing research interest. Orange peel waste, abundantly generated from household consumption and local markets and collected from the environment, serves as an inexpensive and renewable carbon source rich in fermentable sugars. This study focuses on the utilization of environmentally collected orange peel waste for optimized microbial biopolymer production. Enhancement strategies include the selection of efficient microbial strains, optimization of substrate concentration, and nutritional modulation through carbon-to-nitrogen ratio adjustment and nutrient limitation. Key process parameters such as pH, temperature, aeration, and incubation time are systematically optimized using statistical approaches including Response Surface Methodology (RSM) and Design of Experiments (DoE). Moreover, advanced fermentation strategies such as fed-batch cultivation, immobilized cell systems, and improved downstream processing techniques contribute to increased biopolymer yield and recovery. Recent developments in metabolic and genetic engineering further enhance microbial biopolymer biosynthesis. The integration of environmental waste utilization, microbial efficiency, and process optimization demonstrates the potential of orange peel waste as a sustainable and eco-friendly substrate for biopolymer production.

Keywords: Biopolymer, orange peel waste, environmental waste, optimization strategies, biosynthesis, sustainable materials

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OV-IB3

MICROBIAL PRODUCTION AND EXTRACTION OF KERATIN FROM CHICKEN FEATHER WASTE

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Abstract

The growing environmental burden of petroleum-derived plastics necessitates the development of biodegradable materials derived from renewable resources. Poultry feather waste, generated in large quantities by the poultry industry, is predominantly composed of keratin, a recalcitrant structural protein with significant potential for biopolymer applications. However, the highly cross-linked nature of keratin limits its direct utilization and demands efficient extraction strategies. The present study investigates the sustainable production of keratin-based bioplastic films from chicken feathers using novel keratinolytic bacterial strains. Novel bacterial isolates exhibiting high keratinolytic activity were employed for the biodegradation of pretreated chicken feathers under controlled fermentation conditions. Microbial hydrolysis facilitated the solubilization and recovery of keratin, which was subsequently purified and characterized. The extracted keratin was utilized for bioplastic film fabrication through solution casting with appropriate plasticizers to enhance film flexibility and mechanical performance. The prepared films were subjected to comprehensive physicochemical, mechanical, and structural characterization, including thickness measurement, tensile strength analysis, elongation at break, water uptake behavior, and biodegradation studies. Structural and functional characterization of keratin and the resulting bioplastic films was performed using Fourier Transform Infrared Spectroscopy (FTIR) to confirm characteristic amide bands, while Scanning Electron Microscopy (SEM) was employed to evaluate surface morphology and film homogeneity. Protein quantification assays were conducted to determine keratin yield and extraction efficiency. Biodegradability assessments under soil burial conditions demonstrated progressive degradation, indicating environmental compatibility of the developed films. The findings of this study confirm that microbial keratin extraction using novel bacterial strains represents an efficient, environmentally benign, and sustainable approach for valorization of chicken feather waste. The keratin-based bioplastic films exhibited favorable mechanical integrity, flexibility, and biodegradability, underscoring their potential application as eco-friendly alternatives to conventional synthetic plastics. This work supports circular bioeconomy principles and highlights the role of microbial biotechnology in sustainable material development.

Keywords: Chicken feathers, keratin degradation, bioplastic film, microbial valorization, sustainability.

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OV-IB4

SUSTAINABLE PRODUCTION OF CAROTENOIDS BY MICROORGANISMS USING AGRICULTURAL SUBSTRATES

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Abstract

Carotenoids are naturally occurring pigments responsible for the yellow, orange, and red coloration observed in plants, fruits, vegetables, and a wide range of microorganisms. Owing to their potent antioxidant activity, anticancer potential, and provitamin A properties, carotenoids have attracted considerable interest for applications in the food, pharmaceutical, and cosmetic industries. However, conventional production strategies, including chemical synthesis and extraction from plant sources, are often associated with high production costs and significant environmental burdens. In this context, microbial biosynthesis using agro-based substrates offers a sustainable, cost-effective, and environmentally friendly alternative for carotenoid production. In the present study, selected agro-based materials will be subjected to acid hydrolysis to release fermentable sugars, which will be quantified using the dinitrosalicylic acid (DNS) method and subsequently employed as substrates for fermentation. The nutrient-enriched hydrolysate will serve as the primary carbon source for bacterial cultures inoculated at 5–10% (v/v) and incubated under optimized conditions of temperature (28–30 °C), pH (5–6), agitation speed (150–180 rpm), and incubation period (72–120 h). Fermentation performance will be assessed by monitoring biomass formation, reducing sugar utilization, and carotenoid production. The harvested microbial biomass will be dried, and carotenoids will be extracted using a DMSO–acetone solvent system, followed by analytical characterization using UV–Visible spectroscopy, thin-layer chromatography (TLC), and high-performance liquid chromatography (HPLC). The anticipated outcomes are expected to demonstrate that agro-based substrates can effectively support microbial growth and enhance carotenoid biosynthesis, thereby lowering production costs and contributing to sustainable waste valorization in accordance with circular bioeconomy principles.

Keywords: Carotenoids, Antioxidants, Microbial fermentation, Agro-based substrates, Value-added products, Waste valorization.

BIOTECHNOLOGY IN HEALTH & THERAPEUTICS

(OV-HT1 – OV-HT23, OV-OT1 & OV-OT2)

Almost everybody is enthusiastic about the promise of biotechnology to cure disease and to relieve suffering - Leon Kass

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OV-HT1

EVALUATION OF BIODEGRADABLE BAGASSE-DERIVED NANOCELLULOSE HYDROGEL INCORPORATING *Terminalia chebula* EXTRACT FOR ENHANCED HEALING AND BIOFILM CONTROL

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Abstract:

Nanocellulose obtained from renewable sources such as wood pulp, agricultural by-products, and bacterial cellulose has emerged as a highly promising nanomaterial for advanced biomedical applications owing to its biodegradability, excellent mechanical strength, and versatile surface functionalization. Recent studies have highlighted the potential of integrating phytochemical-rich herbal extracts into nanocellulose-based hydrogels and films to fabricate multifunctional drug delivery systems with enhanced therapeutic performance. *Terminalia chebula*, a medicinal plant rich in tannins and polyphenols, exhibits strong antioxidant, antimicrobial, and anti-inflammatory activities, making it a valuable candidate for encapsulation within nanocellulose matrices to achieve sustained drug release and improved bioactive stability. The global nanocellulose market, valued at USD 673 million in 2024, is projected to reach approximately USD 2.7 billion by 2033, reflecting the rapid expansion of this field, particularly in biomedical and pharmaceutical sectors. Incorporation of *T. chebula* extracts into nanocellulose hydrogels has been reported to significantly enhance swelling capacity, drug loading efficiency, and antibacterial activity, thereby supporting their application in wound healing, topical therapies, and oral drug delivery systems. In addition, nanofibrillated cellulose films offer mechanical integrity and moisture retention properties essential for prolonged and controlled release of plant-derived bioactives. Collectively, these advances demonstrate that the synergistic integration of natural nanocellulose with medicinal herbal extracts provides sustainable, biocompatible, and multifunctional platforms for next-generation plant-based drug delivery systems.

Keywords: Nanocellulose; *Terminalia chebula*; herbal extracts; drug delivery systems; nanocellulose hydrogels; controlled release; antioxidant activity; antimicrobial activity; plant-based biomaterials.

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OV-HT2

PVA/K-CARRAGEENAN BASED BIOMATERIAL ENHANCED WITH COUMARIN FOR BONE TISSUE ENGINEERING APPLICATION – AN IN-VITRO STUDY

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Abstract:

PVA/K-Carrageenan Coumarin doped bio-composite for biomedical applications was synthesized using electrospinning, which paves the way for an advanced nanofibrous scaffold in bone tissue engineering along with a thorough in-vitro investigation. The composite incorporates polyvinyl alcohol (PVA) for its outstanding electrospinnability, mechanical reinforcement and hydrophilicity; κ-carrageenan (K-Carrageenan), a sulfated polysaccharide with biocompatibility, ionic crosslink capacity and biomimetic gelation; and Coumarin, a bioactive phytochemical known to promote osteogenic differentiation through Wnt/β-catenin stimulation, anti-inflammatory regulation by NF-κB modulation and antioxidant scavenging of ROS thus creating a favorable microenvironment for osteogenesis. The fibres are electrospun at 15-20 kV, 0.5-1 mL/h flow rate and 15-20 cm collector distance to result in bead-free nanofibers. The morphological characterization of the ES fibres is also examined by SEM: diameter, 150-350 nm; aligned/porous structure with >80% porosity and complimented by FTIR (shifts in O-H/N-H at 3300 cm^{-1}, C=O at 1705 cm^{-1} suggesting a presence of Coumarin ester structural bonds as well polymer interactions). Early (day 14) scaffold-mediated ALP activity (3.5-4.5 fold comparison; $p<0.01$) and gene upregulation (Runx2: 5.5 fold, Osterix: 4.8 fold, Osteocalcin: 5.2fold by qRT-PCR). Coumarin synergizes with nanofiber cues to activate BMP/Smad and MAPK pathways, outperforming PVA-only by 2x. PVA/K-Carrageenan/Coumarin electrospun scaffolds demonstrate robust performance with MG-63 human osteosarcoma cells, a standard osteoblast-like line for bone biomaterial screening, showing high cytocompatibility and bioactivity suited for tissue engineering. PVA/K-Carrageenan/Coumarin electrospun nanofibrous scaffolds exhibit exceptional utility in bone tissue engineering due to their multifaceted design addressing key challenges like mechanical mismatch, bioactivity deficits, and integration barriers in defect repair.

Keywords: PVA, κ-carrageenan, Coumarin, FTIR, SEM, MG-63 cell lines.

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OV-HT3

SOL–GEL AND ELECTROSPINNING APPROACHES FOR CELLULOSE ACETATE–CURCUMIN WOUND DRESSING MATERIALS

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Abstract:

Cellulose acetate–curcumin nanocomposites and nanofibrous membranes were prepared using sol–gel and electrospinning methods for potential wound healing applications. Curcumin is a well-known bioactive compound, but its poor stability and low dispersion limit its direct use in biomedical materials. In this work, cellulose acetate was used as a biocompatible polymer to improve curcumin incorporation. The prepared materials were characterized using scanning electron microscopy (SEM) and Fourier transform infrared spectroscopy (FTIR). SEM results showed that the sol–gel method produced compact nanocomposite structures, while electrospinning resulted in uniform, continuous nanofibrous membranes with high surface area. FTIR analysis confirmed the presence of curcumin within the cellulose acetate matrix and indicated interactions between the polymer and curcumin functional groups. The study demonstrates that the fabrication method strongly influences material structure. In particular, the electrospun cellulose acetate–curcumin membrane appears promising for wound dressing applications due to its fibrous morphology and biocompatible nature.

Keywords: Cellulose acetate, Curcumin, Sol–gel method, Electrospinning, Nanocomposite, Nanofibrous membrane

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OV-HT4

PHYTOCHEMICAL LOADED NANOFORMULATIONS FOR ENHANCED DIABETIC WOUND HEALING AND TISSUE REGENERATION

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Abstract:

Chronic wounds, including diabetic foot ulcers, venous leg ulcers, and burns, present major clinical challenges characterized by impaired healing, recurrent infections, compromised angiogenesis, and unresolved inflammation. Plant-based phytochemicals offer therapeutic potential through their anti-inflammatory, antioxidant, antimicrobial, and pro-angiogenic activities. Yet, their clinical utility is limited by poor water solubility, chemical instability, low bioavailability, and inadequate dermal penetration. Advances in nanotechnology-based delivery systems—including nanoparticles, nano-emulsions, liposomes, hydrogels, and electro spun nanofibers—have improved phytochemical stability and targeted delivery to wound tissues. Nano-formulated agents like curcumin, asiaticoside, quercetin, and aloe-derived polysaccharides demonstrate accelerated wound closure, enhanced collagen deposition, activation of VEGF and TGF-β signalling, and reduced pro-inflammatory mediators such as TNF-α, IL-6, and NF-κB in preclinical models. Preliminary clinical evidence supports their safety and therapeutic efficacy in chronic wound management. However, significant challenges remain, including formulation reproducibility, scalability for commercial production, regulatory approval pathways, and the need for robust clinical validation. This review synthesizes current advancements in nano-formulation strategies, preclinical and clinical findings, translational barriers, and future directions for phytochemical-based nanomedicines in wound healing, with insights into industrial development perspectives.

Keywords: Chronic wound healing, nano-medicine, nano-formulations, Phytochemicals, Collagen deposition.

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OV-HT5

PHYTOCHEMICAL PROFILING, BIOACTIVITY EVALUATION, ISOLATION AND WOUND HEALING EFFICIENCY OF LAKADONG TURMERIC *(Curcuma longa).*

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Abstract:

Turmeric, scientifically known as *Curcuma longa*, has traditionally been considered a medicinal plant. One of the most common uses of turmeric is for treating wounds. Because of its bioactive potential, Lakadong turmeric, grown in Meghalaya, has been the source of more scientific interest due to its high content of curcumin. The study examined the phytochemical analysis, biological activities, and systematic extraction of Lakadong turmeric from Tamil traditional medicine. Phytochemical profiling of the crude extract was done using a series of UV-Visible spectroscopy, FTIR, and LC-Mass Spectrometry. Compounds detected have been found to be rich in phenolic and flavonoid contents. A quantitative estimation showed a very high level of total phenolic content (TPC) and total flavonoid content (TFC), which confirms the antioxidant capacity of the extract. Antioxidant activity was quantified with free radical scavenging assays, while anti-inflammatory activity was assessed in an in-vitro protein denaturation method; both attributes showed bioactivity which was concentration-dependent. The encouraging results motivated the investigation of the main active compound by chromatographic techniques. Elaborative characterization of the isolated compound is currently in progress with the help of advanced analytical tools. The preliminary in-vitro wound healing study performed through a scratch assay demonstrated that extract has a positive impact on cell migration and this would provide evidence to suggest a stimulation in the tissue regeneration process.

Keywords: Lakadong turmeric; *Curcuma longa*; Phytochemical profiling; Antioxidant activity; Anti-inflammatory activity; Wound Scratch assay.

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OV-HT6

RESPONSE–MEDIATED GENETIC ADAPTATIONS IN ANTIMICROBIAL RESISTANCE

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Abstract:

Antimicrobial resistance (AMR), a worldwide threat to both humans and environment is rising at an alarming rate. It is predominantly caused by the overuse or improper use of antibiotics. In order to adapt to the antibiotic "attack," bacteria employ three main strategies, inducing mutations in a gene (usually the antibiotic's target), antibiotic modification and horizontal gene transfer (HGT) of foreign DNA coding for resistance determinants. According to the World Health Organization (WHO), antimicrobial resistance (AMR) is among the top ten global health threats. As per the estimates, bacterial AMR contributed to 1.27 million deaths worldwide in 2019. Various factors including biofilm formation, target site modifications, enzymatic antibiotic degradation, efflux pumps, as well as genetic mutation contribute to AMR. Reports show that one of the most crucial stress response pathways, the bacterial SOS response pathway, contributes to antimicrobial resistance in pathogens. LexA repressor and RecA coprotease are the two master regulators of this pathway. RecA homologs are found in both prokaryotes and eukaryotes, whereas LexA is found only in prokaryotes, thereby making it a suitable drug target. By inhibiting LexA repressor and the SOS pathway, we can possibly reduce the occurrence of AMR. This literature review discusses the SOS response, its underlying mechanisms, triggering factors, biological impact, and approaches to overcome or inhibit SOS activation in various pathogens.

Keywords: Antimicrobial resistance, mutation, SOS response, LexA, RecA, biofilm formation

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OV-HT7

EVALUATION OF *Anethum graveolens* PHYTOCOMPOUNDS AS POTENTIAL AROMATASE INHIBITORS FOR PCOS TREATMENT

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Abstract:

The study focuses on the *Anethum graveolens* (dill) to inhibit the aromatase enzyme and this enzyme (CYP19A1) is responsible for converting testosterone and androstenedione into estradiol and estrone respectively by irreversible processes. Aromatase, a key target in treating estrogen-dependent diseases like breast cancer, endometriosis, and some metabolic disorders. Molecular docking and computational modelling analyses were performed to evaluate the binding affinity, interaction patterns and conformational stability of key phytochemicals with the aromatase enzyme. *Anethum graveolens* is an herb also known to be a dill which contain phytoestrogens and that compounds modulate steroidogenesis. Dill compounds inhibit the aromatase by which it utilized for the Poly Cystic Ovary Syndrome (PCOS). The study highlights the presence of promising natural inhibitors in *Anethum graveolens* capable of modulating aromatase function to restore the hormonal balance and reduce androgen excess in PCOS. Computational evidence reflects that these compounds are able to interact with aromatase in an effectively which contribute to the improvement of symptoms related to hyperandrogenism and ovulatory irregularities. These studies identify more lead compounds and their potential application in the development of safer, plant-derived therapeutic candidates for managing estrogen-dependent disorders and endocrine disorders. This discovery illustrates the potential of *Anethum graveolens* as an alternative therapy for hormone-related disorders and provides an outline for future development in plant-based approaches for reproductive represents a significant advancement in natural therapeutic strategies for PCOS.

Keywords: *Anethum graveolens*, Aromatase Inhibitors, Poly Cystic Ovary Syndrome (PCOS), Molecular Docking, Steroidogenesis, Endocrine disorders.

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OV-HT8

APOPTOTIC INDUCTION POTENTIAL OF *Fenneropenaeus indicus* EXTRACT ON HUMAN BREAST ADENOCARCINOMA CELL LINES (MCF-7 CELL LINES)

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Abstract:

Breast cancer remains one of the leading causes of cancer-related mortality among women worldwide, necessitating the exploration of safer and more effective therapeutic alternatives. Marine organisms have emerged as promising sources of bioactive compounds with anticancer potential. The present study investigates the apoptotic induction and cytotoxic potential of *Fenneropenaeus indicus* (Indian white prawn) shell extract against human breast adenocarcinoma (MCF-7) cell lines. Shrimp shells were processed to obtain bioactive extracts rich in astaxanthin compounds. The cytotoxic effects of the extract were evaluated using the MTT assay, while genotoxic and apoptotic activities were assessed through DNA fragmentation analysis. Phytochemical profiling was carried out using Thin Layer Chromatography (TLC) to identify key bioactive constituents. The results demonstrated a dose-dependent reduction in MCF-7 cell viability, accompanied by characteristic DNA fragmentation, indicating the induction of apoptosis. In silico molecular docking studies further supported the interaction of identified bioactive compounds with apoptosis-related molecular targets, providing mechanistic insight into their anticancer action. Overall, this study highlights the significant anticancer potential of *Fenneropenaeus indicus* shell-derived bioactive compounds and supports their possible application as natural, cost-effective adjuncts in breast cancer therapy. Further studies are warranted to validate these findings through advanced molecular and in vivo investigations.

Keywords: Breast cancer, MCF-7 cell line, *Fenneropenaeus indicus*, Astaxanthin, Apoptosis, Molecular docking.

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OV-HT9

EVALUATION OF ANTIOXIDANT, ANTI-INFLAMMATORY AND THROMBOLYTIC POTENTIAL OF OIL EXTRACTED FROM *Hermetia illucens* PREPUPAE

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Abstract:

Growing interest in sustainable bioresources and naturally derived therapeutic agents has driven research toward non-conventional biological materials with potential biomedical applications. *Hermetia illucens* (Black soldier fly), although not intended for direct human consumption, has gained attention as a valuable industrial bioresource owing to its high lipid yield, rapid life cycle, and efficient eco-friendly biomass conversion capability. The present study evaluates the antioxidant, anti-inflammatory, and thrombolytic properties of oil extracted from the prepupae of *Hermetia illucens*, highlighting its relevance in bioresourcing of natural products and innovations in healthcare. Prepupal oil was obtained using an aqueous extraction method and subjected to *invitro* biological evaluation. Antioxidant activity was assessed using the hydrogen peroxide scavenging assay to determine the ability of the extract to neutralize reactive oxygen species. Anti-inflammatory activity was evaluated using the human red blood cell (HRBC) membrane stabilization method, reflecting prevention of lysosomal membrane damage during inflammatory responses. Thrombolytic activity was determined through an *invitro* clot lysis assay under controlled laboratory conditions. Experimental procedures, observations, and results were systematically recorded and analyzed following standard scientific protocols. The findings demonstrated significant hydrogen peroxide scavenging activity, effective stabilization of HRBC membranes, and appreciable clot lysis potential, indicating presence of biologically active constituents in the prepupal oil. These results suggest that *Hermetia illucens* prepupal oil possesses promising functional properties suitable for pharmaceutical and biomedical research rather than dietary applications. The study emphasizes utilization of non-edible insect-derived bioresources as sustainable, cost-effective alternatives to conventional natural products and supports environmentally responsible bioprocessing approaches globally.

Keywords: *Hermetia illucens*, prepupal oil, aqueous extraction, hydrogen peroxide scavenging assay, HRBC membrane stabilization, thrombolytic activity.

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OV-HT10

STUDIES OF WITHAFERIN A IN TARGETING HSP90A OF HEPATOCELLULAR CARCINOMA

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Abstract:

Background: Hepatocellular carcinoma (HCC) is the fourth leading primary liver cancer compared worldwide in recent statistics published by WHO. HSP90α is an early prognosis and diagnosis marker of HCC.
Objective: Withaferin A, a steroidal lactone present in *Withania somnifera* reported in earlier studies to treat breast cancer, colon cancer was used to study the effect of binding stability with HSP90α in HCC.
Methods: Withaferin A and the standard control drugs, Sorafenib, Geldanamycin and Dexamethasone was docked with HSP90α and top 10 interacting proteins in PPI of HCC using Autodock 4.2. MD simulation analysis was carried out with Withanolide and the control drugs using GROMACS for a time period of 200 ns.
Results: Withaferin A has shown maximum negative binding energy of -8.51 Kcal/mol when compared with Sorafenib, Geldanamycin and Dexamethasone of -6.15, -6.25 and -6.8 Kcal/mol. Moreover, Withaferin A was shown significant binding energy with 2 interacting target receptors of HSP90α linked with Liver, DNAJB1 and TP53 respectively. RMSD analysis of MD simulation of Withaferin A with HSP90α has shown more stable complex from 60 ns to 155 ns with an average RMSD of 0.55 nm. RMSF analysis of Withaferin A and the other 3 control drugs has shown insignificant carbon-α fluctuations showing stable binding.
Conclusion: These computational binding analysis findings of Withaferin A with HSP90α of HCC have revealed that this drug can be used for the effective treatment of HCC. However, *in-vitro* and *in-vivo* studies was also performed to confirm the binding studies.

Keywords: Withaferin A, HSP90α, Hepatocellular carcinoma, RMSD, RMSF.

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OV-HT11

AI-ASSISTED IDENTIFICATION OF PHYTOCHEMICAL INHIBITORS OF RNA-DEPENDENT RNA POLYMERASE IN RESPIRATORY VIRUSES

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Abstract:

The identification of phytochemical inhibitors targeting RNA-dependent RNA polymerase (RdRp) in respiratory viruses by AI signifies a leading advancement in contemporary antiviral medication research. Recent advancements in cheminformatics and machine learning have facilitated the rapid exploration of extensive phytochemical libraries, elucidating intricate structure-activity connections frequently overlooked in conventional screening methods. This concept study involves encoding curated plant-derived compounds with chemical descriptors and fingerprints, followed by the use of supervised learning models trained on established RdRp inhibitors from several respiratory viruses. Top-ranked candidates will be further prioritized by structure-based virtual screening, encompassing molecular docking and molecular dynamics, to assess the binding affinity and conformational stability of critical interaction networks within conserved RdRp motifs. Calculating binding free energy using MMGBSA/PBSA methodologies would enhance the selection of lead phytochemicals with favorable energetics and strong binding profiles across various viral polymerases, hence augmenting their broad-spectrum potential. Additionally, in silico ADMET and drug-likeness filters are incorporated into the AI process to eliminate compounds with inadequate pharmacokinetics or toxicity profiles, hence improving translational relevance. The presented framework demonstrates how AI can systematically reduce the extensive natural product landscape to a feasible selection of high-value candidates and facilitate further experimental validations in RdRp enzymatic tests and cell-based antiviral models. This AI-assisted technique utilizes the chemical diversity of phytochemicals and the conserved structure of respiratory virus RdRp to expedite the identification of novel, potentially broad-spectrum antiviral medicines.

Keywords: Respiratory Viruses, Antiviral, Phytochemical, Molecular Docking

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OV-HT12

A GC-CONTENT–DRIVEN HIDDEN MARKOV MODEL FOR PROTEIN-LEVEL DISEASE PREDICTION"

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Abstract:

A novel GC-based Hidden Markov Model (HMM) algorithm was developed as a computational approach to classify proteins as normal or disease-associated by analyzing guanine–cytosine (GC) content. The method converts biological protein sequences into statistical representations suitable for HMM processing. GC-specific feature extraction is performed by focusing on four amino acids—Alanine (A), Proline (P), Glycine (G), and Arginine (R)—which are preferentially encoded by GC-rich codons. A 2-gram amino acid encoding strategy is employed to quantify the frequency of two consecutive amino acid pairs, resulting in 16 distinct combinatorial patterns derived from these four residues. An R-based script transforms these pattern frequencies into numerical feature scores that serve as input observations for the HMM. Protein classification is achieved by determining the model that yields the highest probability for a given observation sequence. Preliminary evaluation using 50 protein sequences obtained from the GenBank database demonstrated an accuracy of 92%. This approach exploits the biological association between high GC content, genomic stability, and functionally important protein-coding regions (isochores), thereby offering a biologically informed feature framework for molecular-level disease prediction.

Keywords: Amino acid, Hidden Markov Model, Guanine, Cytosine, Alanine, Glycine

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OV-HT13

HESPERIDIN MITIGATES AROCLOR-1254–INDUCED OXIDATIVE STRESS, MITOCHONDRIAL DYSFUNCTION, AND APOPTOSIS IN RAT BRAIN

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Abstract:

The present study attempted to evaluate the neuroprotective potential of hesperidin against Aroclor 1254, a polychlorinated biphenyl mixture known to induce severe oxidative and apoptotic disturbances in the brain of adult male Wistar rats. Aroclor 1254 administration (2 mg/kg b.wt., i.p., 30 days) resulted in significant (P<0.01) behavioral impairments, accompanied by increased oxidative stress indicated by elevated levels of lipid peroxidation, protein carbonyls, and nitrite in the cerebral cortex, cerebellum, and hippocampus. These biochemical alterations were further associated with a marked depletion of antioxidant defense components, including SOD, CAT, and GSH. Mitochondrial dysfunction was evident through enhanced mitochondrial swelling and reduced mitochondrial membrane potential, suggesting compromised membrane integrity. Additionally, Aroclor 1254 exposure dysregulated key apoptotic markers, characterized by upregulated Bax and caspase-3 expression and suppressed Bcl-2 levels, indicating activation of intrinsic apoptotic pathways. However, hesperidin treatment at 100 mg/kg significantly (P<0.01) restored behavioral performance, reduced oxidative biomolecule accumulation, and reinstated antioxidant enzyme levels more effectively than the 50 mg/kg dose. Hesperidin (100 mg/kg) also ameliorated mitochondrial dysfunction and normalized the expression of Bax, Bcl-2, and caspase-3. These findings suggest hesperidin as a promising neuroprotective agent against Aroclor-1254-induced oxidative stress and apoptosis.

Keywords: Aroclor 1254, Hesperidin, Neurotoxicity, Oxidative Stress, Apoptosis

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OV-HT14

INVESTIGATIONS ON EFAVIRENZ RESISTANCE OF HIV- 1

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Abstract:

Efavirenz (EFV) is a widely used non-nucleoside reverse transcriptase inhibitor (NNRTI) that targets the reverse transcriptase (RT) enzyme of Human Immunodeficiency Virus type-1, a crucial component in viral replication and antiretroviral therapy. EFV inhibits RT by binding to a hydrophobic allosteric pocket adjacent to the catalytic site, thereby inducing conformational changes that suppress polymerase activity. In the present study, the clinically relevant HIV-1 RT G190A mutant was modelled using the wild-type RT crystal structure (PDB ID: 3MEC) and analysed through molecular docking and 100 ns molecular dynamics (MD) simulations with EFV. Molecular docking performed using CCDC GOLD revealed a reduced binding affinity of EFV towards the G190A mutant, with a docking score of approximately 42 kcal/mol compared to 55 kcal/mol for the wild-type complex, indicating weakened ligand binding. Structural validation through superimposition showed an RMSD of 1.5 Å, confirming the reliability of the mutant model. MD simulation analyses further demonstrated altered structural stability and flexibility in the mutant RT. RMSD analysis showed higher deviation in the G190A mutant (~0.30–0.35 ns) compared to the wild type (~0.18–0.22 ns), indicating reduced conformational stability. RMSF analysis revealed increased residue fluctuations in the mutant, particularly within the NNRTI-binding region, suggesting enhanced flexibility and destabilization. Protein–ligand contact and secondary structure analyses indicated weakened and more transient interactions in the mutant complex.

Keywords: HIV-1, Efavirenz, G190A, Molecular Docking, Molecular Dynamics

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OV-HT15

COMPUTATIONAL ANALYSIS OF ELVITEGRAVIR RESISTANCE MEDIATED BY Q148R - SUBSTITUTION IN THE INTEGRASE PROTEIN FROM HIV-1

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Abstract:

Elvitegravir (EVG), a first-generation integrase strand transfer inhibitor (INSTI), and plays a crucial role in inhibiting the integration of HIV-1 viral DNA into the host genome. The emergence of resistance-associated mutations within the HIV-1 integrase enzyme has limited its long-term efficacy. Among these, the Q148R mutation is known to significantly affect inhibitor binding. In the present study, *in silico* approaches were employed to investigate the molecular basis of EVG resistance by comparing its interaction with wild-type and Q148R-mutated HIV-1 integrase. Molecular docking analyses revealed a noticeable decline in binding affinity of EVG towards the mutant integrase. Furthermore, 100 ns molecular dynamics simulations were done using Desmond software that showed increased structural fluctuations, reduced stability, and weakened non-covalent interactions, including hydrogen and halogen bonds, in the mutant complex compared to the wild type. These computational findings suggest that the Q148R substitution induces conformational changes that compromise the EVG binding efficiency. Overall, this study provides valuable molecular-level insights into integrase inhibitor resistance and implies the significance of residue Q148 in maintaining the structural and functional integrity of HIV-1 integrase, aiding future anti-HIV drug design strategies.

Keywords: HIV-1, Elvitegravir, Integrase Inhibitor, Q148R, Molecular Dynamics

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OV-HT16

EXPLORATION OF RALTEGRAVIR RESISTANCE IN HIV-1: A COMPUTATIONAL APPROACH

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Abstract:

The development of the Q148R mutation in the HIV-1 Integrase (IN) enzyme poses a serious threat to the effectiveness of raltegravir (RAL), which is still an essential tool for managing HIV. Numerous secondary mutations in the Q148 pathway have the potential to dramatically reduce susceptibility to RAL inhibitor, even if new resistance mutations seem to only confer minimal levels of cross-resistance to second-generation medicines. In this study, one of the clinically essential IN mutants (MT)-Q148R was simulated for 100ns with the RAL inhibitor to gain insights into the evolution of IN resistance to second-generation inhibitors, utilising in silico techniques. The binding stability and structural interactions of a particular protein-ligand complex that represents HIV integrase with an anti-HIV medication are examined in this work using molecular dynamics simulations. The WT complexes remained comparatively stable, with limited backbone fluctuations and persistent ligand contacts, whereas MT-Q148R complexes exhibited higher flexibility, fewer direct and water-mediated hydrogen bonds, and more variable ligand positioning. Overall, these findings indicate that the Q148R mutation disrupts the active-site geometry and interaction network, thereby weakening inhibitor binding and providing a clear structural explanation for the observed drug-resistant phenotype.

Keywords: HIV, IN Enzyme, RAL resistance, Q148R, Molecular Dynamics

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OV-HT17

COMPREHENSIVE EVALUATION OF BIOACTIVES OF *Kappaphycus alvarezii* AND *Gracilaria edulis* THROUGH CHEMICAL PROFILING AND IN SILICO ANALYSES FOR PREDICTED THERAPEUTIC AND NUTRACEUTICAL POTENTIAL

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Abstract:

Marine red algae *Kappaphycus alvarezii* and *Gracilaria edulis* represent valuable sources of sustainable bioactive compounds, and their metabolite profiles were investigated using integrated chemical and in silico approaches. The metabolite extract obtained by methanol extraction via Soxhlet extraction was analysed using FTIR and GC–MS methods. The chemical composition of *K. alvarezii* and *G. edulis* was clearly distinguishable based on their metabolic differences. For example, *K. alvarezii* contained a larger amount of long-chain(C20–C34) aliphatic hydrocarbons and an aromatic portion, whereas *G. edulis* contained a larger proportion of terpenoids and saturated hydrocarbons. In addition, some of the major metabolites in each species were predicted by PASS analysis to exhibit antioxidant, anti-inflammatory, antiviral, and antibacterial properties: *G. edulis*(phytol, hexacosane, heneicosane, pentacosane, bicyclo[2.2.1]heptan-2-one derivatives) and *K. alvarezii*(1-tetradecene, 4,6-dimethyldodecane, benzaldehyde derivatives, hexadecane, bicyclo[2.2.1]heptan-2-one). The estimated ADME results show that *G. edulis* has a higher absorption rate, solubility, and ability to penetrate the blood-brain barrier compared to K. alvarezii. *G. edulis* metabolites were determined to be hydrophilic and distributed throughout the body, whereas *K. alvarezii* metabolites were determined to be lipophilic, with low potential for systemic exposure. Overall, the combination of these findings supports the potential of both types of red seaweed to provide future nutraceutical and therapeutic uses in pharmaceutical and functional food products.

Keywords: *Kappaphycus alvarezii*; *Gracilaria edulis*; Bioactive compounds; FTIR, GC-MS; *In silico* analysis.

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OV-HT18

ASSESSMENT OF CARDIORESPIRATORY FITNESS STATUS OF RICE MILL WORKERS OF KANCHIPURAM DISTRICT, TAMILNADU

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Abstract:

Background: The prevalence of occupational health hazards and mortality has been reported to be unusually high among people of India. In India, 58.45% of the population majorly depends on agro-based industries like rice mill industry which is the oldest and largest industry. During the operation in rice mills workers appeared various stages such as sun drying of the paddy, cleaning, and hulling/ husking, separating, polishing and grading, due to that they suffered related to respiratory illness. **Aim:** To assess the cardiorespiratory fitness status of ricemill workers. **Objective:** To evaluate the effect of exposure to rice husk dust on cardiorespiratory fitness (CRF) of the rice mill workers. **Methodology:** A total of 89 rice mill workers with 51 exposed and 38 unexposed workers were included in the study. After obtaining the informed consent, Anthropometric measurements and physical examination, their resting heart rate, blood pressure and Peak Expiratory Flow Rate (PEFR) were recorded. Also Physical Activity Score (PAS) and Metabolic Equivalents (MET) were calculated. **Result:** There was not significant change in heart rate, blood pressure, PAS and MET score but there was a significant decrease in PEFR from 268.68 L/min to 179.22 L/min with increase in working years of rice mill workers to 20 years. **Conclusion:** Measures need to be taken to prevent the occurence of health hazards in the rice mill workers.

Keywords: Cardiorespiratory fitness, Rice mill workers, MET, PEFR, PAS, Blood pressure

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OV-HT19

IN VITRO ANALYSIS AND ANTI-INFLAMMATORY PROPERTIES OF SEED EXTRACTS OF *Cucurbita maxima* AND ITS EFFECT ON BENIGN PROSTATE INFLAMMATION

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Abstract:

Benign prostate inflammation is commonly associated with lower urinary tract symptoms and may contribute to the development of benign prostatic hyperplasia. Due to limitations and side effects of conventional anti-inflammatory drugs, there is increasing interest in plant-based therapeutic alternatives. *Cucurbita maxima* (pumpkin) seeds are rich in bioactive compounds and have been traditionally used to support prostate health. This study aimed to evaluate the in vitro anti-inflammatory activity of *Cucurbita maxima* seed extracts and their potential role in managing benign prostate inflammation. Seed extracts were prepared using appropriate solvents and subjected to phytochemical screening. The anti-inflammatory potential was assessed using standard in vitro assays, including inhibition of protein denaturation, membrane stabilization, and nitric oxide scavenging activity. The extracts demonstrated significant, dose-dependent anti-inflammatory effects, likely due to the presence of phenolics, flavonoids, and other bioactive constituents. These findings suggest that *Cucurbita maxima* seed extracts possess promising anti-inflammatory properties and may serve as a natural therapeutic candidate for benign prostate inflammation. Further in vivo and clinical studies are recommended to confirm their efficacy and underlying mechanisms.

Keywords: *Cucurbita maxima*, seed extract, anti-inflammatory activity, in vitro, benign prostate inflammation

Our task must be to free ourselves by widening our circle of compassion to embrace all living creatures – Albert Einstein

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OV-HT20

IN-VITRO ASSESSMENT OF ANTIOXIDANTS AND ANTIDIABETIC ACTIVITIES OF POLYPHENOLS – RICH EXTRACTS FROM *Cucumis sativus* SEEDS

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Abstract:

This study was designed to assess the bioactive compounds and natural superactive antioxidants present in the extract of *Cucumis sativus* seed (CSS). The antioxidant capacity of the CSS was evaluated by various radical scavenging ability and other nutraceutical property of CSS extracts were carried out by estimating the levels of total phenolic (128.5 ± 0.1 mg Gallic Acid equivalents /g) and flavonoid (76.5 ± 0.2 mg Myricetin equivalents /g) contents. The aqueous extract of CSS sample exhibited maximum antioxidant activity than organic samples. The antidiabetic property of polyphenols was estimated through inhibition activity of alpha amylase for Type I diabetics. The experiments were evaluated the influence of CSS extract on the nutritional value and oxidative stability. CSS has the potential to be designed as a nutraceutical or bioingredients with high antioxidative properties for elders for enhancing the nutritional value of their diet and it may be the best alternative source for synthetic antioxidants anti diabetic drugs.

Keywords: *Cucumis sativus,* antioxidant, polyphenols, flavonoids, free radicals, prostate.
Corresponding Author:

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OV-HT21

THERAPEUTIC EFFICACY OF AN AMORPHOUS CALCIUM PHOSPHATE-BENZIMIDAZOLE MR10 NANOCONJUGATE AGAINST CORTICOSTEROID-INDUCED SECONDARY OSTEOPOROSIS IN VIVO

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Abstract:

Corticosteroid-induced secondary osteoporosis (CISO) is a severe skeletal disorder characterized by progressive bone loss, impaired mineralization, and heightened oxidative stress, underscoring the need for effective therapeutic strategies. This study aimed to evaluate the osteoprotective potential of an amorphous calcium phosphate–tagged benzimidazole derivative MR10 nanoconjugate (ACP-MR10 NC) against dexamethasone (DEX)- induced osteoporosis using zebrafish as an *in-vivo* model. The nanoconjugate was synthesized and characterized for drug loading efficiency, release kinetics, particle size distribution, surface charge, and morphological properties. Both larval and adult wild-type zebrafish were exposed to DEX to induce osteoporotic phenotypes, followed by therapeutic administration of ACP-MR10. Skeletal mineralization, locomotor behavior, oxidative stress biomarkers, and bone-specific gene expression profiles were systematically assessed. Results demonstrated that ACP-MR10 significantly reduced DEX-induced reactive oxygen species accumulation, restored antioxidant enzymes including superoxide dismutase and catalase, and decreased lipid peroxidation and apoptotic activity in larvae. In adult zebrafish, ACP-MR10 preserved trabecular microarchitecture, vertebral alignment, and mandibular bone integrity while enhancing calcium and phosphorus deposition. Molecular analyses revealed downregulation of osteoclast-associated genes indicating restoration of balanced bone remodeling. Collectively, these findings highlight ACP-MR10 nanoconjugates as a promising therapeutic candidate for mitigating corticosteroid-induced osteoporosis through coordinated antioxidant protection and enhanced osteogenic remodeling.

Keywords: Osteoporosis, benzimidazole, nanoconjugate, drug delivery

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OV-HT22

LICACHALCONE A AND ITS DERIVATIVES PROMOTE NEURONAL DIFFERENTIATION OF AN EMBRYONIC STEM CELL LINE

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Abstract:

The etiology and incidence of neurodegenerative illness have reached their pinnacle in the realm of modern medicine. The main factor behind the neurodegenerative disease is neuronal loss. The current treatment is focused on the induction of neuronal differentiation as a therapeutic solution to promote neuronal regeneration. Small molecules promoting the neuronal differentiation of embryonic stem cells in the central nervous system (CNS) can be used as regenerative medicine. Licochalcone A (1) is a major polyphenolic compound from *Glycyrrhiza inflata* (licorice). Licochalcone A exerts multiple biological activities such as anti-oxidative, neuroprotective, antibacterial, anti-stroke, osteogenic, anti-inflammatory activity, and antidepressant activity. These findings suggest that Licochalcone A is an ideal candidate for treating neurological and neurodegenerative diseases. Although the crystal structure of LA has been revealed, there have been few attempts to modify its structure for improving its neuritogenic and anti-neurodegenerative activity. To the best of our knowledge, we report for the first time that Licochalcone A **(1)** and its derivatives (**2**) or (**3**) or their combination induced the differentiation of mammalian P19 embryonic stem cells to neuronal cell lines in vitro [Durairajan et al. 2019 Indian Patent Appl. 201941038499]. By screening a series of Licochalcone A synthetic analogs 2 or 3 or 4, we identified only 1, 2, and 3 but not 4 induced neuronal differentiation of pluripotent P19 cells at 5 μM concentration of each compound from 1 to 7th day. The present study thus provides an effective method for reprogramming mouse embryonic stem cells toward neuronal cells, using Licochalcone-A and/or its derivatives.

Keywords: Neurodegenerative diseases, Licachalcone A, Neurogenesis, Neuronal Differentiation, ERK pathway.

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OV-HT23

SURVEILLANCE OF PREVALENCE AND DISTRIBUTION OF CARBAPENAM RESISTANT HYPERVIRULENT *Klebsiella pneumoniae* IN AND AROUND MADURAI.

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Abstract:

Background: *Klebsiella pneumoniae* has emerged as a major cause of healthcare-associated and community-acquired infections. The increasing prevalence of carbapenam resistance coupled with the emergence of hypervirulent strains poses a serious public health threat in the post-COVID era. Carbapenemase-producing *K. pneumoniae* (CP-Kpn) are one of the most significant threats to public health, because the carbapenems are the last available therapeutic drugs for eradicating these infections. **Objectives:** This study aimed to surveil the prevalence and regional distribution of carbapenam-resistant hypervirulent *Klebsiella pneumoniae* in and around Madurai. **Methods:** A cross –sectional study was conducted on clinical isolates of *Klebsiella pneumoniae* collected from patients attenting hospitals and clinical laboratories in and around Madurai during the period of two years from July'2022 to June 2025. Standard microbiological procedures were done for isolation and identification and antimicrobial susceptibility testing was performed to detect carbapenamase resistance. Carbapenam-resistant isolates were further analysed for hypervirulence using phenotypic string test. **Results:** Among the total 254 isolates, (27.9%) cases were showed resistance to Carbapenam, (10.2%) cases were identified as hypervirulent *Klebsiella pneumoniae* .Based on Age wise distribution, most number of cases (49.2%) were belong to the age group of 26- 45 and in Gender distribution, infected populations were high in female(69%) and least in males (30.9%). District wise distribution , Madurai tops the first among 71 cases (59.1%) and least in Sivagangai (21.1%). On account to vaccination, 100% were vaccinated. **Conclusion:** This study highlights carbapenam resistance and hypervirulence underscores the urgent need for continous regional surveillance, strict infection control measures and robust antimicrobial stewardship programs to prevent the further spread.

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OV-OT1

RECONSTITUTING COLLAGEN STABILITY IN BACTERIAL SYSTEMS THROUGH HYDROXYPROLINE INCORPORATION

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Abstract:

The most prevalent structural protein in the human body, collagen's distinct triple-helical structure and hierarchical fibrillation is essential for preserving the mechanical integrity of connective tissues. Hydroxyproline, a post-translationally modified amino acid that strengthens triple helix formation by hydration-mediated hydrogen bonding, is essential for native collagen durability. Despite its widespread use, animal-derived collagen has little industrial and clinical application. Because of their specified composition and scalable synthesis, recombinant bacterial collagen-like proteins (CLPs) have emerged as a possible non-animal alternative to overcome those restrictions, yet their lack of hydroxyproline significantly impairs heat stability and fibrillation behaviour. In order to restore native-like structural properties, hydroxyproline is incorporated into a recombinant collagen-like protein. A proline auxotrophic Escherichia coli expression system was used to implement a residue- specific unnatural amino acid incorporation approach. Its ribosome inclusion during protein synthesis was made possible by controlled cultivation under proline-depleted conditions supplemented with hydroxyproline, avoiding the lack of eukaryotic post-translational modification machinery. Affinity-based purification techniques were used to successfully express and purify the hydroxyproline-incorporated CLP to homogeneity. Hydroxyproline must be included in order to stabilise the collagen triple helix and encourage appropriate fibrillation, both of which are critical to the activity of collagen. In addition to establishing a basis for the development of structurally stable collagen mimetics pertinent to collagen-associated illnesses and biomaterial applications, this work offers a controlled bacterial platform for the investigation of collagen structure–fibrillation interactions.

Keywords: Collagen-Like Protein, Hydroxyproline Incorporation, Bacterial Collagen, Triple Helix Stability, Fibrillation.

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OV-OT2

GREEN SYNTHESIS OF CARBON NANOPARTICLES FROM *Barleria cristata* USING A BIOSOOT METHOD

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Abstract:

Green synthesis of carbon nanoparticles (CNPs) has gained increasing attention due to its eco-friendly nature, low cost, and sustainability. In the present study, carbon nanoparticles were synthesized using a biosoot method derived from flower *Barleria cristata*, a naturally available plant resource. The biosoot was obtained through controlled combustion of dried flower material and subsequently processed and dispersed in an aqueous medium to produce carbon nanoparticles without the use of toxic chemicals or complex synthesis routes. The synthesized carbon nanoparticles were characterized using Dynamic light scattering (**DLS**) technique to evaluate their size and dispersion behaviour. The analysis revealed that the particles predominantly fall within the nanoscale region, with major intensity distribution peaks observed around ~364 nm and ~529–641 nm, indicating the formation of nano-sized carbon structures with minimal agglomeration. In addition, the samples exhibited low polydispersity index (PDI) values ranging from 0.006 to 0.092, suggesting a narrow particle size distribution and good dispersion stability. The mean particle size and distribution profiles confirm the successful synthesis of carbon nanoparticles via the biosoot approach. This study demonstrates a simple, green, and sustainable strategy for synthesizing carbon nanoparticles using *Barleria cristata*, highlighting the potential of plant-derived biosoot as an effective carbon source. Further studies are currently in progress to investigate the biological properties of the synthesized carbon nanoparticles and to explore their potential applications in biomedical and environmental fields.

Keywords: Carbon nanoparticles, Biosoot method, green synthesis, *Barleria cristata*, DLS, polydispersity

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PV-OT1

PHYTOCHEMICAL PROFILING AND ANTIMICROBIAL EVALUATION OF TALINUM FRUTICOSUM AGAINST *Klebsiella pneumoniae* AND *Aspergillus niger*

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Abstract:

The emergence of antimicrobial resistance among pathogenic microorganisms has renewed scientific interest in the discovery of novel bioactive compounds from plant sources. *Talinum fruticosum*, commonly known as waterleaf, is traditionally used in folk medicine for treating various infections. This study aimed to investigate the phytochemical constituents and evaluate the antimicrobial efficacy of *Talinum fruticosum* leaf and stem extracts against *Klebsiella pneumoniae* and *Aspergillus niger*. The leaves were extracted using chloroform, ethanol, and methanol solvents, and phytochemical screening was performed to identify bioactive components. Antibacterial and antifungal activities were assessed using the agar well diffusion method. The phytochemical analysis revealed the presence of, flavonoids, saponins and phenols,. The methanolic extract of leaf exhibited the highest antimicrobial activity with a maximum inhibition zone of 2.3 mm against *K. pneumoniae* and 1.8 mm against *A. niger*. The methanolic extract of stem exhibited the highest antimicrobial activity with a maximum inhibition zone of 1.3 mm against *K. pneumoniae* and 1.2 mm against *A. niger*. These findings suggest that *T. fruticosum* contains potent bioactive compounds with promising therapeutic potential as a natural antimicrobial agent.

Keywords: Talinum fruticosum, phytochemicals, antibacterial, antifungal, Klebsiella pneumoniae, Aspergillus niger, bioactive compounds

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PV-OT2

ARTIFICAL INTELLIGENCE – THE AUGUMENTED PHYSICIAN

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Abstract:

AI offers a chance to enhance diagnostic precision, optimise treatment paths, and expedite administrative operations given the proliferation of digital healthcare data (genomics, electronic health records, and medical imaging). By providing capabilities that mimic and improve human cognitive functions, artificial intelligence (AI) is radically changing the healthcare paradigm from reactive to proactive. My poster presentation will focus on the achievements and advancements of artificial intelligence in Medical field.

Keywords: Artificial intelligence, Health care, Diagnosis, Treatment

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PV-HT1

ARTIFICIAL FRAGRANCE, A THREAT TO THE ENVIRONMENT –A COMPREHENSIVE REVIEW

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Abstract:

This comprehensive review paper explores the multifaceted impact of digital technology on education. In the present era where cosmetics are used to make people, objects, and spaces smell pleasant baggage of health hazards.

Artificial fragrances are widely used in perfumes, air fresheners, and personal care products, but they pose a significant threat to the environment. These fragrances release volatile organic compounds (VOCs) such as benzene into the air, contributing to air pollution, smog formation, and poor indoor air quality. During washing and bathing, fragrance chemicals enter water bodies, where they harm aquatic organisms and disrupt ecosystems. Reducing the use of artificial fragrances and opting for natural alternatives can help minimize pollution and protect environmental and human health. The primary objectives of this review are to assess the evolving health risks using the perfumes which contain many components with one being Benzene.

Drawing from an extensive collection of literature, this review offers insights into the challenges faced in the manufacture and usage of benzene a known carcinogen, and while it is not intentionally added to perfumes, trace amounts can sometimes be found due to contamination or as a by product of certain ingredients. Some solvents, preservatives, and synthetic fragrances used in perfume production may degrade or contain benzene derivatives.

Keywords: Health Hazards, Volatile organic compounds, synthetic fragrances.

About the College:

Dwaraka Doss Goverdhan Doss Vaishnav College was founded in 1964 by Rajasthani and Gujarati settlers in Chennai. The college began its academic journey with a B.Sc. Mathematics program, guided by its first Principal, Shri Totadri Iyengar—a distinguished educator best known for mentoring Dr. APJ Abdul Kalam. The college aims to impart knowledge and value-based education. It has been a hub for learners for over six decades, founded on Vaishnavism principles. The college has grown significantly in infrastructure and curriculum, catering to students' needs, and has emerged as a premier institution due to its students' outstanding academic and extracurricular performance. The college regularly updates its curriculum, adopts an interdisciplinary approach, fostering industry-academia collaboration, and has partnered with several reputed institutions and organizations. Upholding its long-standing tradition of excellence, the college has consistently maintained top-tier NAAC accreditation, reaffirming its commitment by securing the prestigious A++ grade in its third cycle. Its NIRF 2025 ranking of 91 under college category highlights the institution's continued commitment to delivering impactful, high-quality education.

About the Conference:

Launched in 2021, this flagship event by the Biotechnology Department annually explores cutting-edge themes in microbial innovation, algae research, gene technology, and biotech entrepreneurship. This year's theme, "Sustainable Innovations Towards Viksit Bharat Vision," aligns with India's Amrit Kaal roadmap to become a developed nation by 2047, emphasizing economic growth, social development, sustainability, and global leadership.The conference highlights the role of biotechnology in addressing societal challenges. It offers a global platform for researchers to share insights, bridge knowledge gaps, and foster innovation for collective progress.

About the Department:

The Post Graduate Department of Biotechnology at Dwaraka Doss Goverdhan Doss Vaishnav College, established in 2001, offers B.Sc. and M.Sc. programme aimed at nurturing talent in life sciences and research. With a curriculum rooted in practical training and frontier applications, the department equips students with essential skills for biotechnology careers. Modern labs, a dedicated library, and internet resources support hands-on learning. To enhance academic exposure, the department hosts seminars, workshops, guest lectures, and field visits to research institutes and industries, enabling industrial interactions through internships, training programs and Value Added Courses. Together, these initiatives create a dynamic learning environment that empowers students to grow as skilled biotechnologists ready to meet emerging scientific and industrial challenges.

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