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Scientific Innovations in Agriculture, Humanities and Allied Sciences for Better Public Health and Environment

[SIBPHE-2025]

Organized by

Madhav University, Abu Road, Rajasthan
MB College of Agriculture, Tonk
Agriculture Forum for Technical Education of Farming Society
Vital Biotech Edu. Group, Kota

on

19- 20 September, 2025

- **Dr. Gitam Singh**
- **Dr. Suresh Jakhar**
- **Dr. Mukesh Kumar Jat**
- **Sh. Ram Singh Goura**

VITAL BIOTECH PUBLICATION

NATIONAL CONFERENCE ON

SIBPHE-2025

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Editors

Dr. Gitam Singh
Dr. Mukesh Kumar Jat
Dr. Suresh Jakhar
Sh. Ram Singh Goura

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VITAL BIOTECH PUBLICATION

Kota, Rajasthan, India

http://www.vitalbiotech.org/bookpublication/

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https://www.portico.org/publishers/vital/

101 Greenwich Street, 18th Floor

New York, NY 10006

Published by Vital Biotech Publication
First Edition: 2025

Product Form:
Digital download, online and Paperback

Edition:
ISBN: 978-93-48793-36-2

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Rajasthan-324009 India
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Contact No. +91-9784677044

Printed at: Vinayak Printers, Kota

Greetings Message

It gives me immense pleasure to extend my warm greetings and best wishes to all the distinguished guests, participants, academicians, researchers, and students on the occasion of the *National Conference on Scientific Innovations in Agriculture, Humanities and Allied Sciences for Better Public Health and Environment*, being organized by Madhav University, Abu Road, Rajasthan and MB College, Tonk**,** under the aegis of the Agriculture Forum for Technical Education of Farming Society (AFTEFS) and VITAL BIOTECH EDUCATIONAL GROUP, Kota**,** on *19th–20th, 2025*.

This conference brings together experts from diverse disciplines on a common platform to deliberate upon the latest innovations, research trends, and sustainable practices. At a time when our society is facing complex challenges of climate change, food security, health, and environmental sustainability, such initiatives hold great relevance. I firmly believe that interdisciplinary collaboration and innovative research are the key drivers for ensuring a healthier and more sustainable future.

I am confident that this academic gathering will inspire meaningful discussions, generate new ideas, and contribute towards strengthening the linkage between science, technology, and society. The outcomes of this conference will not only enrich knowledge but also guide policy makers, educators, and young researchers towards addressing real-world problems effectively.

I convey my best wishes for the grand success of this conference and hope it will pave the way for new horizons of learning, collaboration, and innovation.

Prof. (Dr.) Raj Kumar Rana
Founder & Chairman
Madhav University

MESSAGE

A Resplendent Welcome to participants of SIBPHE 2025!

It is with immense joy and profound pleasure that I extend my warmest welcome to all of you in the National Conference SIBPHE 2025 as esteemed participants.

I appreciate the opportunity to offer my greetings and best wishes to the organizers and participants of the **National Conference on Scientific Innovations in Agriculture, Humanities and Allied Sciences for Better Public Health and Environment**. This important event, hosted by **Madhav University** and **MB College** and organized under the aegis of the **Agriculture Forum for Technical Education of Farming Society (AFTEFS)** and **VITAL BIOTECH Educational Group**, is a commendable initiative.

In a world facing urgent challenges related to climate change, food security, and holistic human development, this conference serves as a vital platform. It brings together a diverse community of academicians, researchers, policymakers, and young scholars to explore the critical intersection of agriculture, humanities, and allied sciences. By fostering a multidisciplinary dialogue, the conference is poised to advance scientific knowledge and generate innovative solutions for the betterment of society.

I am confident that the collaborative exchange of ideas will not only enrich academic understanding but also catalyze practical and impactful solutions for sustainable agriculture, healthier communities, and a cleaner environment.

My sincere congratulations to the organizers for their foresight in uniting these diverse fields. I wish the conference immense success and trust that its deliberations will pave the way for meaningful contributions that benefit us all.

With my best wishes

Dr. Narendra Singh Rathore
Former Vice Chancellor, MPUAT, Udaipur, MLSU Udaipur and GGTU Banswara.
Founder Vice Chancellor, SKNAU Jobner
Former DDG (Engineering) and DDG (Education) ICAR New Delhi,
Former National Director, World Bank project NAHEP, ICAR, New Delhi
Former Dean CDFST, Dean CTAE and DSW MPUAT, Campus Director GITS, Udaipur, Rajasthan
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Vice-Chancellor
कुलगुरु

Prof. Arvind Kumar Shukla
प्रो. अरविन्द कुमार शुक्ला

No./VC/2025-26/.1538..
Dated: ..10/09/2025...

Message

I am delighted to extend my heartfelt greetings to all participants, dignitaries, and organizers of the *National Conference on Scientific Innovations in Agriculture, Humanities and Allied Sciences for Better Public Health and Environment*, jointly organized by Madhav University, Abu Road, Rajasthan, and MB College, Tonk, under the aegis of the Agriculture Forum for Technical Education of Farming Society (AFTEFS) and VITAL BIOTECH Educational Group, Kota, scheduled on 19th–20th September 2025.

This conference comes at a crucial time when the world is striving to balance agricultural productivity with environmental conservation and public health. Agriculture, the backbone of our economy, must now evolve through innovative practices that not only ensure food and nutritional security but also safeguard natural resources for future generations. Equally important is the role of humanities and allied sciences, which bring social, ethical, and cultural perspectives into scientific discourse—making solutions more holistic and people-centric.

By fostering dialogue among academicians, researchers, practitioners, and young scholars, this conference provides a vibrant platform for knowledge sharing, collaborative learning, and innovative problem-solving. Discussions on themes such as climate resilience, sustainable technologies, health linkages, and socio-economic development will undoubtedly generate ideas that are both academically enriching and practically relevant.

I sincerely appreciate the efforts of the organizing committee for conceptualizing such an interdisciplinary event that connects science with society. I am confident that the deliberations will inspire new strategies, impactful innovations, and sustainable models that benefit farmers, communities, and the environment alike.

My best wishes for the grand success of this conference.

(Arvind Kumar Shukla)

SURESH GYAN VIHAR UNIVERSITY

Greetings Message

It gives me immense pleasure to extend my heartfelt greetings on the occasion of the *National Conference on Scientific Innovations in Agriculture, Humanities, and Allied Sciences for Better Public Health and Environment*, being organized by Madhav University, Abu Road, Rajasthan, and MB College, Tonk, under the aegis of AFTEFS and VITAL BIOTECH Educational Group, Kota, on 19th–20th September 2025.

The theme of this conference reflects a visionary approach toward a progressive and sustainable future. Agriculture, the cornerstone of human civilization, now stands at a crucial juncture where innovation, sustainability, and social responsibility must converge. This conference commendably brings together agriculture, allied sciences, and the humanities, acknowledging that the future of food security, public health, and environmental well-being lies in interdisciplinary collaboration.

We are living in an era of rapid scientific advancement. However, the true impact of science emerges when it is guided by ethical values, empathy, and cultural understanding. The inclusion of the humanities in this discourse is both timely and vital, as it allows us to craft solutions that are not only technologically sound but also socially meaningful and environmentally sustainable.

I am confident that the deliberations at this conference will spark innovative ideas and foster a deep sense of responsibility among young researchers and academicians to align their work with the larger goals of societal and environmental well-being.

I congratulate the organizers for their dedication and foresight, and I extend my best wishes for the grand success of this academic initiative. May it serve as a significant milestone in shaping a healthier, more sustainable, and inclusive future.

02/09/2025

Prof. Arunansu Haldar
Hon'ble Vice-Chancellor
Suresh Gyan Vihar University, Jaipur

Greetings Message

It is a matter of great honor and pleasure for me to extend my heartfelt greetings on the occasion of the *National Conference on Scientific Innovations in Agriculture, Humanities and Allied Sciences for Better Public Health and Environment*, jointly organized by Madhav University, Abu Road, Rajasthan, and MB College, Tonk under the aegis of the Agriculture Forum for Technical Education of Farming Society (AFTEFS) and VITAL BIOTECH Educational Group, Kota, on 19th–20th September 2025.

The theme of this conference is highly relevant in the present era when agriculture, health, and environment are facing interconnected challenges. Scientific advancements in agriculture and allied sciences must be directed not only towards enhancing productivity but also towards ensuring nutritional security, ecological balance, and overall human well-being. The inclusion of humanities and allied sciences in this platform is truly commendable, as it highlights the importance of integrating human values, ethics, and social perspectives with scientific progress.

I firmly believe that the deliberations of this conference will generate valuable insights, new research directions, and innovative solutions that will contribute significantly to sustainable farming systems, improved public health, and environmental conservation. Such events provide opportunities for knowledge exchange, foster collaboration among experts, and encourage young scholars to take forward the mission of building a healthier and sustainable future.

I congratulate the organizers for their dedicated efforts in bringing together eminent academicians, scientists, and researchers on one platform. I extend my best wishes for the grand success of this conference and trust that it will achieve meaningful outcomes for society and the nation.

Sh. Himmat Singh Deval
Chairperson, Madhav University

MADHAV UNIVERSITY
Dedicated to Excellence

Greetings Message

I am honored to extend my warm greetings to the organizers and participants of the *National Conference on Scientific Innovations in Agriculture, Humanities and Allied Sciences for Better Public Health and Environment*, jointly organized by Madhav University, Abu Road, Rajasthan, and MB College, Tonk, under the aegis of the Agriculture Forum for Technical Education of Farming Society (AFTEFS) and VITAL BIOTECH Educational Group, Kota, scheduled on 19th–20th September 2025.

The chosen theme of this conference is of great significance in today's rapidly changing world. Agriculture, which has long been the backbone of our economy, is now expected to play a far more comprehensive role in ensuring food and nutritional security, environmental balance, and public health. By integrating agriculture with humanities and allied sciences, this event demonstrates a holistic vision where technology, sustainability, and human values converge to address present and future challenges.

Conferences of this nature act as catalysts for innovation and collaboration. They provide a platform for scientists, academicians, policymakers, and young scholars to share their experiences and explore innovative approaches. The discussions on climate resilience, sustainable farming, health awareness, and environmental conservation will not only enhance knowledge but also lead to practical outcomes that benefit farmers, communities, and society at large.

I sincerely appreciate the efforts of the organizing team for bringing together experts from diverse disciplines on one platform. I am confident that this conference will prove to be a milestone in generating new ideas and strengthening our commitment toward sustainable development and public welfare.

I wish the conference grand success.

Prof. Rajeev Mathur
President, Madhav University

Greetings Message

I feel greatly honored to extend my warm greetings to the organizers, esteemed guests, speakers, delegates, and participants of the *National Conference on Scientific Innovations in Agriculture, Humanities and Allied Sciences for Better Public Health and Environment*, jointly organized by Madhav University, Abu Road, Rajasthan, and MB College, Tonk, under the aegis of the Agriculture Forum for Technical Education of Farming Society (AFTEFS) and VITAL BIOTECH Educational Group, Kota, on 19th–20th September 2025.

The theme of this conference holds immense significance in today's context, where agriculture and allied sciences must go beyond conventional practices to embrace innovations that ensure sustainability, health, and environmental balance. By incorporating humanities along with agriculture and science, the organizers have rightly highlighted the importance of connecting technological advancements with human values, cultural awareness, and societal development. Such a holistic approach is essential for addressing contemporary challenges.

I sincerely congratulate the organizers for their vision, commitment, and efforts in hosting this event of academic and societal relevance. I extend my best wishes for the grand success of the conference and hope it will inspire meaningful outcomes for farmers, communities, and future generations.

Sh. Suneel Bansal
Director
M.B. College of Agriculture
Tonk, Rajasthan

Greetings Message

I am delighted to extend my heartfelt greetings to the organizers, dignitaries, and participants of the *National Conference on Scientific Innovations in Agriculture, Humanities and Allied Sciences for Better Public Health and Environment*, jointly organized by Madhav University, Abu Road, and MB College, Tonk, under the aegis of the Agriculture Forum for Technical Education of Farming Society (AFTEFS) and VITAL BIOTECH Educational Group, Kota, on 19th–20th September 2025.

The significance of this conference lies in its holistic approach to addressing some of the most pressing issues of our time. Agriculture is not merely about crop productivity; it is intrinsically linked with food and nutritional security, environmental sustainability, climate resilience, and the overall health of communities. By integrating agriculture with allied sciences and humanities, the conference highlights the necessity of interdisciplinary collaboration to design solutions that are both scientifically sound and socially relevant.

In today's context, challenges such as soil degradation, biodiversity loss, climate variability, and public health concerns demand innovative strategies that bridge the gap between research, practice, and policy. This forum provides an excellent platform for academicians, scientists, practitioners, and young researchers to share their insights, discuss emerging trends, and develop actionable strategies. I am confident that the deliberations will inspire new ideas, promote sustainable practices, and contribute to building a healthier and environmentally responsible society.

I sincerely appreciate the vision and commitment of the organizers in bringing together experts from diverse fields. I wish the conference great success and look forward to the impactful contributions it will make.

Dr. Bharti Desai
Director, Homeopathy Medical College
Madhav University

Greetings Message

It is my privilege to extend heartfelt greetings and best wishes on the occasion of the *National Conference on Scientific Innovations in Agriculture, Humanities and Allied Sciences for Better Public Health and Environment*, jointly organized by Madhav University, Abu Road, and MB College, Tonk, under the aegis of the Agriculture Forum for Technical Education of Farming Society (AFTEFS) and VITAL BIOTECH Educational Group, Kota, during 19th–20th September 2025.

This conference marks a significant step towards advancing the cause of education, research, and innovation by providing a vibrant platform for knowledge sharing across multiple disciplines. The inclusion of agriculture, humanities, and allied sciences under one umbrella reflects a holistic vision, recognizing that sustainable development and public health cannot be addressed in isolation but require integrated solutions.

In today's rapidly changing scenario, agriculture is not only about enhancing crop productivity but also about ensuring nutritional security, protecting natural resources, and promoting ecological balance. Similarly, humanities and allied sciences provide the much-needed socio-cultural and ethical dimensions to scientific progress, thereby ensuring that innovations are people-centric and environmentally sustainable.

I am confident that the deliberations of this conference will result in constructive outcomes, opening new pathways for interdisciplinary research, policy dialogue, and practical strategies that benefit farmers, communities, and the nation at large.

I congratulate the organizing team of Madhav University and MB College, along with AFTEFS and VITAL BIOTECH, for their vision and efforts in convening this academic endeavor. I wish the conference grand success and hope it becomes a milestone in promoting sustainable growth and public well-being.

Sh. Ram Singh Goura
Joint Director
Suresh Gyan Vihar University, Jaipur

Greetings Message

I am pleased to extend my heartfelt greetings to the organizers and participants of the *National Conference on Scientific Innovations in Agriculture, Humanities and Allied Sciences for Better Public Health and Environment*, jointly organized by Madhav University, Abu Road, and MB College, Tonk, under the aegis of the Agriculture Forum for Technical Education of Farming Society (AFTEFS) and VITAL BIOTECH Educational Group, Kota, scheduled on 19th–20th September 2025.

The theme of this conference is highly relevant to the challenges and opportunities of the 21st century. Agriculture today is no longer confined to crop production alone; it encompasses environmental stewardship, public health, nutrition, and socio-economic well-being. By integrating humanities and allied sciences into this platform, the organizers have demonstrated remarkable vision in promoting holistic growth that connects technological innovation with human values and societal needs.

Such conferences serve as a catalyst for intellectual exchange, providing researchers, academicians, policymakers, and young students with an opportunity to deliberate on pressing issues like sustainable farming practices, resource conservation, climate change, and the role of science in improving community health and environment. The outcomes of these discussions will undoubtedly contribute to shaping future strategies and policies aimed at creating a resilient agricultural system and a healthier society.

I congratulate the organizing team for their dedication and commitment in bringing together eminent experts from diverse fields. I am confident that the deliberations will inspire innovative ideas and pave the way for impactful collaborations. I extend my best wishes for the grand success of this academic endeavor.

Dr. Bhawesh Kumawat
Registrar, Madhav University
Aburoad, Sirohi, Rajasthan

प्रसार शिक्षा निदेशालय
रानी लक्ष्मी बाई केन्द्रीय कृषि विश्वविद्यालय
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डॉ. एस. के. सिंह
निदेशक प्रसार शिक्षा
Dr. S. K. Singh
Director Extension Education

F. No:19 59/RLBCAU/DEE/2025

Date: 30/08/2025

Greetings Message

I am pleased to extend my warm greetings to the organizers, distinguished speakers, participants, and delegates of the *National Conference on Scientific Innovations in Agriculture, Humanities and Allied Sciences for Better Public Health and Environment*, is being jointly organized by Madhav University, Abu Road, and MB College, Tonk, under the aegis of the Agriculture Forum for Technical Education of Farming Society (AFTEFS) and VITAL BIOTECH Educational Group, Kota, on 19th–20th September 2025.

The theme of this conference reflects a forward-looking vision, where science and society move together for a better tomorrow. Agriculture, in the present scenario, is not just about increasing production—it is about ensuring sustainability, inclusive growth protecting our environment, improving human health, and empowering rural communities. The integration of humanities with agricultural and allied sciences is especially significant, as it emphasizes that knowledge must be people-centric, value-based, and responsive to societal needs.

This conference provides an excellent platform for intellectual exchange, bringing together experts, academicians, policymakers, and students to deliberate on innovative approaches for sustainable agriculture and improved public health. The deliberations are expected to address crucial issues such as climate resilience, natural resource management, nutritional security, and eco-friendly technologies. Such collaborative efforts will undoubtedly lead to new insights and solutions that can be translated into policies and practices benefiting farmers, consumers, and the environment alike.

I congratulate the organizers for their vision and commitment to organizing such a multidimensional academic event. I wish the conference great success and hope it inspires meaningful innovations for a healthier, greener, and more sustainable future.

S. K. Singh

उद्यानिकी एवं वानिकी महाविद्यालय
College of Horticulture and Forestry
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डॉ. मनीष श्रीवास्तव
अधिष्ठाता
Dr. Manish Srivastav
Dean

No.2543/Dean/CoHF/RLBCAU/2025

Dated: 02-09-2025

Greetings Message

It is indeed a matter of great pleasure for me to extend my warm greetings on the occasion of the *National Conference on Scientific Innovations in Agriculture, Humanities and Allied Sciences for Better Public Health and Environment*, jointly organized by Madhav University, Abu Road, Rajasthan, and MB College, Tonk, under the aegis of the Agriculture Forum for Technical Education of Farming Society (AFTEFS) and VITAL BIOTECH Educational Group, Kota, during 19th–20th September 2025.

The theme of this conference is highly relevant in today's world where agriculture is no longer confined to productivity alone but is deeply interlinked with nutrition, public health, and environmental sustainability. The inclusion of humanities and allied sciences adds further value by ensuring that science and technology are contextualized within societal needs, cultural ethics, and human development. This holistic approach is the true need of the hour.

I believe that the conference will serve as a dynamic platform where researchers, academicians, policymakers, and students will engage in meaningful deliberations, share innovations, and develop actionable strategies to tackle challenges such as climate change, food and nutritional security, environmental degradation, and community well-being. The exchange of knowledge and ideas in such gatherings has the power to shape future directions of research, inspire young minds, and foster collaborative efforts that bring real impact at the grassroots level.

I sincerely appreciate the organizers for their vision and dedication in creating this academic platform. I extend my best wishes for the grand success of the conference and hope it will emerge as a milestone event with impactful outcomes for agriculture, society, and humanity.

(Manish Srivastav)

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भाकृअनुप-केन्द्रीय कृषिवानिकी अनुसंधान संस्थान
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Greetings Message

It gives me great pleasure to extend my warm greetings and best wishes on the occasion of the *National Conference on Scientific Innovations in Agriculture, Humanities and Allied Sciences for Better Public Health and Environment*, jointly organized by Madhav University, Abu Road, Rajasthan, and MB College, Tonk, under the aegis of the Agriculture Forum for Technical Education of Farming Society (AFTEFS) and VITAL BIOTECH Educational Group, Kota, on 19th–20th September 2025.

The theme of this conference is highly relevant in today's context, where the challenges of food and nutritional security, environmental degradation, and public health demand innovative, sustainable, and interdisciplinary solutions. Agriculture, being the backbone of our economy, cannot work in isolation. Its progress must be harmonized with allied sciences and enriched with the insights of humanities to ensure that growth is inclusive, ethical, and sustainable.

I am delighted that this conference seeks to bring together scientists, academicians, policymakers, and young researchers from diverse disciplines on one platform. Such interactions not only broaden our understanding but also strengthen the bridge between research and real-life applications. I believe the deliberations will generate new ideas, inspire collaborative research, and pave the way for innovations that directly benefit farming communities and society at large.

I congratulate the organizers for their vision in creating this platform of knowledge exchange and collaboration. I wish the conference grand success and look forward to its contributions in shaping a future where agriculture, health, and environment progress hand in hand for the well-being of humanity.

Handa

Dr. A. K. Handa
Nodal Scientist
ICAR-Central Agroforestry Research Institute

भाकृअनुप-केन्द्रीय कृषिवानिकी अनुसंधान संस्थान
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Greetings Message

It is a matter of great pleasure for me to extend my warm greetings and best wishes on the occasion of the *National Conference on Scientific Innovations in Agriculture, Humanities and Allied Sciences for Better Public Health and Environment*, being jointly organized by Madhav University, Abu Road, and MB College, Tonk under the aegis of the Agriculture Forum for Technical Education of Farming Society (AFTEFS) and VITAL BIOTECH Educational Group, Kota, during 19th–20th September 2025.

The theme of this conference is highly relevant to present-day challenges where agriculture is no longer confined to food production alone but has expanded its scope to address environmental concerns, public health, nutrition, and the overall well-being of society. The inclusion of humanities and allied sciences in this discourse makes the event more comprehensive, as it allows scientific innovation to be understood in the light of ethics, culture, and social responsibility.

In today's world of rapid change, such academic gatherings serve as catalysts for fresh ideas, collaborative research, and practical solutions. By bringing together eminent scientists, academicians, policymakers, and young scholars, this conference will surely encourage meaningful dialogue on sustainable farming practices, climate resilience, healthy living, and environmental conservation. It is also a wonderful platform for young minds to be inspired, motivated, and guided by experienced experts.

I congratulate the organizers for their vision and sincere efforts in creating this multidisciplinary forum. I wish the conference grand success and hope the deliberations will generate new pathways for innovation, sustainability, and societal well-being.

Dr. Naresh Kumar
Principal Scientist
ICAR-Central Agroforestry Research Institute

Greetings Message

I feel honored to extend my warm greetings to the organizers, eminent speakers, participants, and delegates of the *National Conference on Scientific Innovations in Agriculture, Humanities and Allied Sciences for Better Public Health and Environment*, jointly organized by Madhav University, Abu Road, and MB College, Tonk, under the aegis of the Agriculture Forum for Technical Education of Farming Society (AFTEFS) and VITAL BIOTECH Educational Group, Kota, on 19th–20th September 2025.

This conference comes at a very crucial time when agriculture is expected to address not just the challenge of higher productivity but also the demands of sustainability, climate resilience, nutrition, and environmental health. What makes this initiative distinctive is its multidisciplinary approach, integrating agriculture and allied sciences with humanities. Such integration ensures that scientific innovations are socially relevant, ethically grounded, and aligned with the overall well-being of communities.

In today's scenario, where climate change, soil degradation, water scarcity, malnutrition, and lifestyle diseases pose serious threats, scientific forums like this play a pivotal role. They serve as platforms to exchange knowledge, deliberate on innovative technologies, and promote collaboration between academia, industry, and policymakers. The outcomes of such interactions not only strengthen the agricultural sector but also contribute directly to improving public health and ensuring a cleaner environment.

I sincerely congratulate the organizers for envisioning such a holistic theme and for bringing together experts, young researchers, and practitioners on one platform. I extend my best wishes for the successful conduct of this conference and trust that its deliberations will generate impactful solutions for a sustainable and healthier tomorrow.

Prof. Shiv Singh Tomar
Dean, School of Agricultural Sciences
GD Goenka University

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Date: 03.09.2025

MESSAGE FROM CONFERENCE DIRECTOR & SOCIETY PRESIDENT

Dear Participants and Honored Guests, On behalf of the *Agriculture Forum for Technical Education of Farming Society (AFTEFS), Kota (Rajasthan)*, it is our great pleasure to welcome you to the *National Conference on "Scientific Innovations in Agriculture, Humanities and Allied Sciences for Better Public Health and Environment"*, jointly organized by *Madhav University, Abu Road, and MB College, Tonk*, under the aegis of AFTEFS and *VITAL BIOTECH Educational Group, Kota*, scheduled on *19th–20th September 2025*.

This landmark conference aims to bring together distinguished scientists, academicians, policymakers, professionals, and young researchers to deliberate on the role of scientific innovations in shaping sustainable agriculture, safeguarding public health, and protecting the environment. By integrating agriculture with allied sciences and humanities, this event emphasizes the importance of interdisciplinary collaboration to address contemporary challenges such as climate change, food and nutrition security, livelihood enhancement, and environmental sustainability.

During the two days of intensive sessions, participants will benefit from thought-provoking lectures, panel discussions, and interactive dialogues led by nationally and internationally renowned experts. The exchange of ideas and sharing of innovative practices will provide valuable insights into modern technologies, holistic approaches, and future strategies for agricultural and societal development.
We are confident that this conference will open new avenues for collaborative research, knowledge sharing, and capacity building, ultimately contributing to a healthier, more sustainable, and inclusive future.

Your active participation and contribution are highly valued, and together we look forward to making this conference a grand success.

Thank You.

Dr. Jitendra Mehta
PRESIDENT, AFTEFS
VITAL BIOTECH, KOTA, RAJASTHAN

Greetings Message

It is my proud privilege to extend warm greetings and best wishes to all participants, delegates, and organizers of the *National Conference on Scientific Innovations in Agriculture, Humanities and Allied Sciences for Better Public Health and Environment*, being hosted by Madhav University, Abu Road, Rajasthan, and MB College, Tonk under the aegis of the Agriculture Forum for Technical Education of Farming Society (AFTEFS) and VITAL BIOTECH Educational Group, Kota, on 19th–20th September 2025.

As Director of the College of Agriculture, Madhav University, I feel deeply honored that our institution is co-hosting this prestigious event. Agriculture today is not merely a sector of food production but a foundation of national prosperity, environmental security, and human health. With rapid advancements in science and technology, there is a strong need to integrate agricultural innovations with allied disciplines and humanities so that sustainable solutions address both scientific and societal needs.

This conference will provide a unique platform where eminent experts, young researchers, and students will interact, share their experiences, and deliberate upon innovative approaches in agriculture, environment, and public health. The focus on interdisciplinary collaboration is especially important at a time when climate change, resource degradation, and nutritional challenges require a comprehensive and inclusive vision.

I am confident that the deliberations and outcomes of this conference will contribute to strengthening sustainable farming practices, improving environmental health, and creating a better future for farming communities and society at large.

I extend my heartfelt congratulations to the organizing team for their dedication and wish the conference grand success.

Dr. Gitam Singh
Conference Organizing Secretary
Director, College of Agriculture
Madhav University, Abu Road, Rajasthan

Greetings Message

It gives me great joy to send my warm greetings on the occasion of the *National Conference on Scientific Innovations in Agriculture, Humanities and Allied Sciences for Better Public Health and Environment*, organized by Madhav University, Abu Road, Rajasthan, and MB College, Tonk, under the aegis of AFTEFS and VITAL BIOTECH Educational Group, Kota, on 19th–20th September 2025.

The subject of this conference reflects the vision of a progressive and sustainable future. Agriculture, which has been the foundation of human civilization, is today at a crossroads where innovation, sustainability, and social responsibility must come together. This conference rightly brings agriculture, allied sciences, and humanities under one umbrella, recognizing that the future of food, health, and the environment depends on interdisciplinary cooperation.

We are living in an age where scientific discovery is advancing at an unprecedented pace. Yet, science alone is not enough—it must be guided by ethics, empathy, and cultural wisdom. The involvement of humanities in this dialogue is, therefore, both timely and essential. By blending knowledge systems, we create pathways for solutions that are holistic, inclusive, and sustainable.

I believe the deliberations in this conference will not only inspire innovative ideas but will also instill a sense of responsibility among young researchers and academicians to align their work with societal needs.

I congratulate the organizers for their commitment and vision. I extend my best wishes for the success of this academic endeavor and hope it emerges as a milestone in shaping a healthier and more sustainable tomorrow.

Dr. Mukesh Kumar Jat
Assistant Professor, School of Agriculture
Suresh Gyan Vihar University, Jaipur

Greetings Message

It is a matter of great pride and honor for me to extend my warm greetings and best wishes on the occasion of the *National Conference on Scientific Innovations in Agriculture, Humanities and Allied Sciences for Better Public Health and Environment*, jointly organized by Madhav University, Abu Road, Rajasthan, and M.B. College of Agriculture, Tonk, under the aegis of the Agriculture Forum for Technical Education of Farming Society (AFTEFS) and VITAL BIOTECH Educational Group, Kota, during 19th–20th September 2025.

Agriculture, the backbone of our economy, is witnessing rapid transformation with the integration of advanced science, modern technology, and sustainable practices. However, the true success of agricultural growth lies not only in enhanced productivity but also in ensuring better public health, nutrition, and environmental sustainability. This conference, by bringing together agriculture, allied sciences, and humanities, reflects a progressive vision of connecting innovation with societal well-being.

The presence of distinguished academicians, researchers, and young minds at this forum will create a vibrant platform to deliberate upon critical issues like climate resilience, eco-friendly farming, food safety, and rural development. I firmly believe that the sharing of knowledge and innovative practices during this conference will inspire new pathways for sustainable agriculture, healthier communities, and a cleaner environment.

I take this opportunity to congratulate all the organizers for their commendable efforts in planning this significant event. I extend my best wishes for the success of the conference and hope it becomes a milestone in shaping a sustainable and healthier future.

Dr. S. K. Jakhar
Conference Convener
Principal
M.B. College of Agriculture, Tonk, Rajasthan

Greetings Message

It gives me immense pleasure to extend my warm greetings to the organizers, distinguished speakers, participants, and delegates of the *National Conference on Scientific Innovations in Agriculture, Humanities and Allied Sciences for Better Public Health and Environment*, jointly organized by Madhav University, Abu Road, and MB College, Tonk, under the aegis of the Agriculture Forum for Technical Education of Farming Society (AFTEFS) and VITAL BIOTECH Educational Group, Kota, on 19th–20th September 2025.

This conference is being held at a critical juncture, when agriculture is not only expected to ensure enhanced productivity but also to address the pressing concerns of sustainability, climate resilience, nutritional security, and environmental health. What makes this initiative truly commendable is its multidisciplinary perspective—integrating agriculture and allied sciences with the humanities—thus ensuring that scientific advancements are socially relevant, ethically grounded, and directed toward holistic community well-being.

In the present scenario, where challenges such as climate change, soil degradation, water scarcity, malnutrition, and lifestyle-related diseases loom large, platforms like this conference acquire great significance. They serve as avenues for knowledge sharing, fostering innovation, and encouraging meaningful collaboration between academia, industry, and policymakers. The deliberations and outcomes of such initiatives will not only strengthen the agricultural and allied sectors but also contribute significantly to public health and a cleaner, more sustainable environment.

I congratulate the organizers for conceptualizing such a forward-looking theme and for providing a common platform to eminent experts, young researchers, and practitioners. I extend my best wishes for the grand success of this conference and am confident that its discussions will yield impactful solutions for building a healthier and sustainable future.

Dr. Arpita Sharma
Associate Professor & Research Coordinator
School of Agricultural Sciences
GD Goenka University

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MESSAGE FROM FOUNDER & CEO VITAL BIOTECH

On behalf of VITAL BIOTECH, I am delighted to extend my best wishes to *Madhav University, Abu Road* and *MB College, Tonk* for jointly organizing the *National Conference on Scientific Innovations in Agriculture, Humanities and Allied Sciences for Better Public Health and Environment*, under the aegis of the Agriculture Forum for Technical Education of Farming Society (AFTEFS) and VITAL BIOTECH Educational Group, Kota, scheduled on 19th–20th September 2025.

This prestigious conference, under the esteemed banner of AFTEFS, is a landmark initiative that brings together renowned experts, academicians, researchers, and practitioners to deliberate on emerging challenges and opportunities in agriculture and allied sciences. By integrating agriculture with humanities and public health perspectives, the conference offers a unique platform for cross-disciplinary collaboration and exploration of innovative ideas that can shape a sustainable and healthier future.

At VITAL BIOTECH, we are deeply committed to fostering technological and scientific advancements in agriculture. We strongly believe that platforms like this are crucial for bridging the gap between research, policy, and practice. The deliberations and knowledge exchange during the conference will not only enrich scientific understanding but also yield practical solutions for farmers, industries, and policymakers to enhance productivity, ensure sustainability, and safeguard environmental and public health.

I am confident that the discussions and outcomes of this conference will inspire groundbreaking innovations, foster meaningful collaborations, and contribute to nation-building through sustainable agricultural and societal development.

Wishing the organizers, speakers, and participants grand success in making this conference a milestone event and a beacon of knowledge for the global community.

Jaya.

Best regards,
Ms. Jaya Mehta
Founder & CEO, VITAL BIOTECH
Kota, Rajasthan, India

Greetings Message

It is my honor and privilege to extend warm greetings and best wishes on the occasion of the *National Conference on Scientific Innovations in Agriculture, Humanities and Allied Sciences for Better Public Health and Environment*, being organized by Madhav University, Abu Road, Rajasthan, in collaboration with MB College, Tonk, under the aegis of the Agriculture Forum for Technical Education of Farming Society (AFTEFS) and VITAL BIOTECH Educational Group, Kota, on 19th–20th September 2025.

The theme of this conference reflects a progressive vision where agriculture and allied sciences are viewed not only as the backbone of food and nutrition security but also as integral to public health, sustainable livelihoods, and environmental protection. In the present scenario, where climate change, ecological imbalance, and lifestyle-related health challenges are becoming global concerns, such an academic platform is both timely and essential.

What makes this conference special is the convergence of agriculture with humanities and allied sciences, highlighting the importance of blending scientific knowledge with ethical, social, and cultural perspectives. This interdisciplinary approach ensures that innovations are not only technologically sound but also socially inclusive and environmentally sustainable.

The deliberations, research presentations, and intellectual exchanges during this event will surely inspire young researchers, promote collaborations, and generate practical strategies for building resilient farming systems, healthier communities, and a cleaner environment.

I wholeheartedly congratulate the organizers for their visionary initiative and wish this conference great success. May it emerge as a milestone in advancing scientific knowledge and contributing meaningfully to the welfare of society.

Dr. Preeti Mahawar
Conference Convener
Associate Professor
College of Agriculture, Madhav University

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SIBPHE-2025/01

Sustainable Livestock Systems: Integrating Nutrition, Management, and Welfare Innovations

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Livestock production is central to world food security, rural livelihoods, and sustainable agriculture. Advances in nutrition, management, and animal welfare over the last decade have transformed production efficiency, product quality, and animal welfare. The latest nutritional approaches focus on precision feeding, ideal protein-energy ratio, micronutrient supplementation, and functional feed additives to improve growth, reproduction, and resistance to diseases. Meanwhile, better management practices ranging from housing design through disease prevention and reproduction efficiency to environmental control have lowered production losses by a considerable margin while maintaining sustainability. Animal welfare, the quintessential ethical and economic factor, has come into increased focus through scientific evaluation of behavior, stress physiology, and enrichment strategies. This overview integrates evidence from recent studies and review literature to discuss how holistic approaches in nutrition, management, and welfare are influencing the future of livestock production. Synthesis points out that although genetic potential provides the foundation for performance, ideal nutrition and management with welfare awareness unlock maximum productivity, enabling profitability and ethical accountability.

Keywords: *Advances, nutrition, management, and animal welfare*

SIBPHE-2025/02

Traditional Veterinary Knowledge and Medicinal Plants: A Global Review

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Ethnoveterinary medicine (EVM) involves traditional knowledge, practices, and beliefs adopted by rural communities for maintaining and restoring livestock health, frequently based on medicinal plants. In settings with limited resources, EVM is an important primary healthcare system for animals that directly benefits rural livelihoods, food security, and cultural heritage. This review brings together science and ethnography from the literature on medicinal plants in rural animal health, examining their therapeutic uses, bioactive phytochemicals, pharmacological testing, and implications for sustainable livestock systems. Based on case studies from Africa, South Asia, and Latin America, we provide details of major plant species, ethnopharmacological functions, and experimental tests of effectiveness. Research finds that plants like *Azadirachta indica* (neem), *Allium sativum* (garlic), *Vernonia amygdalina* (bitter leaf), and *Albizia anthelmintica* have antimicrobial, antiparasitic, and anti-inflammatory activities with quantifiable impacts on animal diseases. Despite this, problems remain, such as variability in plant chemistry, absence of formal dosing standards, risks to biodiversity, and limited incorporation into formal veterinary systems. We promote interdisciplinary programs connecting ethnobotany, veterinary medicine, pharmacology, and conservation biology to validate and manage medicinal plant resources sustainably for the future of rural animal medicine.

Keywords: *Ethnoveterinary medicine, therapeutic uses, livestock, sustainable.*

SIBPHE-2025/03

Trend Analysis of Area under Major Crops in Baghpat District: An Empirical Study

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The study explored the pattern of the region of major crops in Baghpat district between the years 2001–02 to 2021–22. Secondary data were collected from government publications, statistical abstracts, Directorate of Economics and Statistics, Districts Agriculture Office and relevant records. The investigation showed that sugarcane was the leading crop throughout the study period, supported by assured irrigation facilities and strong market demand from sugar mills. Wheat under area reported steady but modest growth, while paddy experienced fluctuations with a slight downward trend in recent years. Conversely, pulses and oilseeds had an extremely small share of the cropped area, representing poor diversification in agriculture in the district. Instability analysis showed sugarcane to be comparatively stable relative to other crops, while paddy and pulses were more variable. The results point out that although Baghpat agriculture is greatly reliant on sugarcane, crop diversification support and encouraging alternate crops are crucial for long-term sustainability and effective use of resources.

Keywords: *Sugarcane, Cropping trend, Crop diversification, market demand.*

SIBPHE-2025/04

Tiny Dots, Big Impact: Carbon Nanodots in Modern Food Technology

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Since the early 2000s, nanotechnology has gained significant attention across various fields, including drug delivery, materials synthesis and electronics manufacturing, due to the unique properties of nanoscale materials. One such promising nanomaterial is carbon dots (CDs), which are nearly spherical particles smaller than 10 nm. CDs typically feature a conjugated sp^2 carbon core and a range of oxygen-containing surface groups, such as hydroxyl, carboxyl and aldehyde groups, which enhance their functionality. Carbon dots were first introduced by Xu *et al*. in 2004 during the purification of single-walled carbon nanotubes, where they were referred to as "fluorescent nanoparticles." CDs can be categorized based on their core structure. Graphene quantum dots consist of a few graphene layers and exhibit properties like edge effects and quantum confinement. Carbon quantum dots have a crystalline and spherical structure, while amorphous carbon nanodots possess a non-crystalline core. Carbonized polymer dots combine polymer chains with a carbon core, forming a hybrid polymer-carbon structure. CDs can be synthesized using either top-down or bottom-up methods. Top-down techniques involve breaking down larger carbon materials like graphite or activated carbon through processes such as arc discharge, laser ablation, ultrasound, or electrochemical treatment. Conversely, bottom-up methods involve assembling small organic molecules through techniques like hydrothermal synthesis, thermal decomposition, microwave-assisted synthesis, or using templates. Thanks to their small size, stability, low toxicity and solubility, CDs have a wide array of applications, notably in bioimaging, solar energy, sensing, medicine and food packaging. In the food

industry, CDs contribute to safety and preservation. Their selective sensitivity allows for the detection of specific contaminants without interference from other substances, enabling real-time monitoring of food quality. CDs can enhance food preservation by serving as coating agents for fruits and vegetables due to their antioxidant properties. They also improve the mechanical strength and barrier performance of biodegradable polymer films in packaging. Additionally, CDs exhibit antibacterial activity through mechanisms involving ROS generation and cell membrane disruption. Their pH-responsive nature allows them to be used in intelligent packaging to indicate spoilage. Overall, CDs offer a novel solution to improve food safety, extend shelf life and reduce waste.

Keywords*: Nanotechnology, Carbon dots, Synthesis, Preservation.*

SIBPHE-2025/05

Impact of Intermittent Fasting on cellular health, autophagy, and molecular markers of aging

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The term Intermittent fasting has interestingly has garnered the significant attention in recent years, though fasting has never been alienated from Indian history. But recently intermittent fasting has witnessed the sudden splurge of eminence because of key mechanism of improving cellular health. It ameliorates the cellular function by the activation of autophagy. Autophagy is the salient cellular process in which the damaged protein and dysfunctional organelles are removed. The formulation of autophagy in maintaining cellular activity and its integrity and cells renewal. The stored cellular waste is mitigated which is intricately linked to neurodegeneration or age-progressive diseases. Fasting controls, the oxidative stress and systemic inflammation by stimulating the broader repair pathway. Extending beyond this intermittent fasting has become the rare providence which supports the metabolic health, improving the insulin sensitivity by reducing the level of insulins from the blood. Compress the risk of diabetes which can impair the cellular performance. Intermittent fasting has majorly influenced the gene regeneration by encouraging the promotion of longevity related genes which protect cells against damage and improve the resilience of cells. It also helps in activating regenerative pathway by acceleration of stem cells. Intermittent fasting vital role in lipids regulation by improving lipids metabolism by maintaining cholesterol, triglyceride, LDL and improving HDL. If promote lipid breakdown and oxidation. In essence the intermittent fasting has massive effect on cellular and molecular mechanism, reducing cortisol stress, by improving cardiovascular and metabolic health. As, rising number of human trails has shown favourable outcomes, it enhances the cellular function and slow down the aging. Numerous studies on human fasting have shown promising results, demonstrating benefits ranging from preserving muscle mass to enhancing focus and improving overall cellular function.

Keywords: *- Fasting, autophagy, Intermittent Fasting, aging and metabolism.*

SIBPHE-2025/06

Estimation of Vigor Index, Chlorophyll Contents and Ascorbic Acid in the different Varieties of Wheat treated with Macro/Micro Nutrients

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Germinating Wheat as unique food for correcting many health hazards related to weakness, fertility, cancer and many more is coming up as modern health food. It consists of 70% chlorophyll. This is significant because chlorophyll is very similar in structure to hemoglobin. Hemoglobin plays a vital part in our red blood cells functionally, enabling the blood to carry oxygen to the different parts of our body; chlorophyll is very similar in structure to hemoglobin. Because of this chlorophyll is often known as "the blood of plant life" Wheatgrass contains vitamin A, vitamin C, B complex vitamins E and K. Vitamin E is very important antioxidant. It is helpful in preventing the body's aging process and also to prevent blood clots and is needed to strengthen the body's immune system. Wheat grass also contains 82 out of the 92 minerals found in soil including calcium, magnesium, iron, zinc, potassium, phosphorus and cobalt. Wheatgrass also contains numerous amino acids. Amino acids are the building blocks the body uses to make proteins. The present studies reveal about the Vigor index, chlorophyll concentration and ascorbic acid contents showed increasing trend in Raj 3765 and Raj 3077 in comparison of control with the treatment of KH_2PO_4 7%, $MgSO_4$ 2%, 5% and 7%, In GW 173 and Raj 3777 also showed the same trend as compared to control. In PBW 343 and WH 147, $MgCl_2$ 2%, urea at 5% and KCl 5% treatment also showed increasing trend along with all the three concentrations of KH_2PO_4 and $MgSO_4$.

SIBPHE-2025/07

Oceanlux: *Sargassum Wightii* for Sustainable Fashion

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As the global demand for sustainable materials continues to rise, the fashion industry is seeking eco-friendly alternatives to traditional raw materials. With concerns over resource scarcity, environmental impact, and the growing population, renewable materials are becoming a necessity rather than an option. Among these, marine algae stand out as a promising, climate-resilient resource. One such marine algae, *Sargassum wightii*, a brown seaweed abundant in the Gulf of Mannar, is rich in alginate, cellulose, fibers, and polyphenols. Notably, it has excellent film-forming properties, making it a strong candidate for bio-based fashion accessory Leather. This study explores the integration of *Sargassum wightii* (at concentrations of 10–50%) into sheet production and evaluates its mechanical and physical performance against conventional PVA-based Leather. The biochemical analysis of *Sargassum wightii* revealed a high fiber content (33.11%) and significant alginate levels (38.53%), both of which contribute to its durability and flexibility. The leather developed from this seaweed had thicknesses ranging from 0.67 mm to 2.16 mm. Testing results indicated that leather with 20–30% *Sargassum wightii* content exhibited tensile strengths between 15.13 MPa and 26.69 MPa, making them suitable for applications in footwear, leather goods, and saddlery. Additionally, these bio-based leather demonstrated improved fire resistance and reduced water absorption compared to conventional materials. Notably, a *Sargassum wightii* leather with 30% incorporation achieved 55.07% of the tensile strength and 100% of the maximum load-bearing capacity of the control PVA leather, highlighting its potential as a viable sustainable alternative. This research underscores the immense possibilities of marine algae in industrial applications, paving the way for the integration of *Sargassum wightii* into the fashion sector. By leveraging nature's resources, the industry can move towards a more sustainable and environmentally conscious future.

Keywords: *Sargassum wightii, PVA, Fashion leather, bio-based*

SIBPHE-2025/08

Microbiomes as Nature's Biofactories: Driving Sustainable Agriculture and Food Security

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The increasing global population, projected to reach 9.8 billion by 2050, demands a 70 per cent rise in food production, intensifying the need for sustainable agricultural practices. Conventional reliance on the chemical fertilizers and pesticides has degraded soil, water and ecosystems, highlighting the urgency for alternatives that preserve natural resources. Microbiomes are the complex communities of microorganisms associated with soil, plants, animals, humans and other environments represent a pivotal solution. In agriculture, the plant-associated microbiome, including rhizospheric, phyllospheric, endophytic, seed, floral and leaf communities, plays critical roles in nutrient acquisition, growth promotion, pest and pathogen suppression and abiotic stress tolerance. Core microbiomes, often inherited *via* seeds, provide stable associations, while satellite taxa add functional diversity. Endophytic microbes particularly demonstrated strong potential as microbial inoculants due to their intimate plant associations and reduced competition with soil micro biota. Advances in molecular techniques such as next-generation sequencing, stable isotope probing and meta-genomics have deepened insights into microbiome structure and function, supporting the development of biofertilizers, biostimulants and biopesticides. Despite market growth projections exceeding $10 billion by 2025, challenges persist regarding strain adaptability, formulation stability and field-level efficacy. Targeting core and endophytic microbiomes may overcome these constraints, offering tailored microbial solutions for sustainable crop

productivity. Ultimately, harnessing plant microbiomes functions as a "second immune system," enhancing plant resilience while promoting environmental and human health. Integrating microbiome-based innovations into modern agriculture provides a transformative pathway toward achieving global food security and sustainability.

Keywords: *Microbiome, Plant-microbe interactions, Sustainable Agriculture*

SIBPHE-2025/09

Value Addition and Shelf-Life Enhancement through Fish Smoking

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Smoking of fish is very popular in India especially in North-East India, where smoked fish and meat are relished as a delicacy. Smoked fish are fish that has been cured by smoking. Smoking is one of the oldest preservation methods, combines the effects of salting, drying, heating and smoking. The process of smoking occurs through the use of fire. Fish is one of the protein foods that need careful handling. However, due to poor handling, about 30-50% of fish harvested are wasted. In order to obtain a product with good quality characteristics, it is essential to understand the mechanisms involved during the smoking process, so that the impact of the smoke inti the fish can be maximized. In addition, it is important to draw the attention of people on the need to assess the health risks associated with the consumption of smoked fish products and consequences. And the necessary measures and steps to reduce such risks in order to have a safer food for the consumers are highly advisable.

Keywords: *Smoking, Fish, Preservation, Drying*

SIBPHE-2025/10

Pupae preservation by using saw dust to cut down the cost of production in commercial grainages: *An innovation technique*

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An investigation was carried out to work out the cost of production and profitability by using saw dust in comparison to corrugated sheet which is generally use in commercial grainage for pupae preservation in India. The findings of the study showed that saw dust is more profitable and economical for silkworm seed producers, as it reduces the cost of production for pupae preservation and the worked out cost shows that by using saw dust rather than corrugated sheet Rs.9.59 can be saved for each corrugated sheet in commercial silkworm seed production centre.

Keywords: *Corrugated sheet, saw dust, pupae, preservation, cost.*

SIBPHE-2025/11

Eco-Health Approaches: Integrating Agricultural and Social Sciences for Public Wellbeing and Planetary Health

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The escalating challenges of climate change, biodiversity loss, environmental degradation, and public health crises demand an integrative framework that transcends disciplinary boundaries. The Eco-heath approach provides a transdisciplinary paradigm that merges agricultural sciences, environmental studies, and social sciences 10 address the complex interdependencies between ecological integrity and human wellbeing. This paper explores cutting-edge scientific advancements such as climate-resilient crop varieties, precision agriculture, agrocoological intensification, and sustainable water resource management, alongside the socio-cultural determinants of health and participatory governance models. Through the integration of One Health principles and ecosystem services frameworks, thes study highlights ferw sustainable agricultural practices such as conservation tillage, integrated pest management, biofertilizers, and organic amendments contribute to enhanced snl microbiome diversity, reduced greenhouse gas emissions, and improved food and mutritional security, Simultaneously, the role of social sciences in shaping behavioural change, risk communication, and policy innovation is emphasized to foster environmental stewardship and equitable health outcomes By employing GIS-based land-use mapping, remote sensing for crop health diagnostics, and socio-ecological modelling, the research underscores the utility of data-driven approaches in promoting adaptive strategies for both public health resilience and ecosystem sustainability. The paper advocates for systems thinking and co-creation of knowledge involving farmers, health practitioners, ecologists, and social scientists to bridge. knowledge gaps and operationalize sustainable development goals (SDGs) Ultimately, the Eco-Health framework demonstrates the potential of interdisciplinary scientific innovation to foster synergistic outcomes improved public health indices, environmental restoration, and climate resilience thereby offering a strategic pathway for harmonizing human and planetary health in the Anthropocene epoch.

Keywords: *Eco-Health, Agroecological intensification, Sustainable water reэжное management, public health, Planetary health*

SIBPHE-2025/12

Effect of IBA and growing media on cuttings of dragon fruit cv. Royal Red and American Beauty

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This study, conducted at Mata Gujri College, Fatehgarı Sahib, Punjab, during the 2024-2025 growing season, aimed to evaluate the individual and synergistic effects of Indole-3-Butyric Acid (IBA) and various growing media on the rooting and shooting of dragon fruit cuttings cv. "Royal Red and American Beauty. A Factorial Complete Randomized Design (FCRD) with three replications was employed, incorporating twelve treatment combinations, These treatments included two IBA concentrations (5500 ppm and 6000 ppm) alone, biofertilizers (PSB2% and AM fungi 2%) and conjunction with a standardized soil sand: vermicompost (2:1:1) blend, alongside a control group (no IBA cultivated soil), Notably, the combined application of S,B, (PSB/a 2% + Soil: Sand: Vermicompost (2:1:1)+ IBA (5500 ppm)) consistently yielded superior results across key root and shoot parameters for both cultivars. This treatment significantly reduced the days required for root initiation (Royal Red: 14,40, American Beauty: 14.66) and maximized the percentage of rooted cuttings (Royal Red: 95.16%; American Beauty: 93,163, Furthermore, SB leads to higher fresh root weight (Royal Red: 2.21g, American Beauty: 2.12g) and dry root weight (Royal Red: 0.56g; American Beauty: 0.54g). In terms of shoot parameters, SB promoted faster shoot initiation (Royal Red: 8.30 days, American Beauty: 8.93 days) and a higher percentage of sprouting (Royal Red: 66.03%; American Beauty: 64.51%). The root to shoot ratio also exhibited favourable results (Royal Red: 0,84; American Beauty; 0,73). This outstanding performance of SB, indicative of enhanced rooting and shooting, was closely followed by SB. (AM fungia 2% + Soil: Sand: Vermicompost (2:1:1) + IBA (5500 ppm)). Conversely, the control group, BS, (No IBA+ cultivated soil), consistently exhibited the lowest values across all measured parameters. This research investigates the various propagation strategies for optimizing dragon frunt, our findings shows the synergistic benehts of microbial amendments and appropriate hormonal treatments.

Keywords: *IBA, growing media, vermicompost, PSB, AM fungi*

SIBPHE-2025/13

Mirror Repeat Identification in Dystrophin Protein, Which Causes Muscular Dystrophy

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Duchenne Muscular Dystrophy (DMD) is the most common and severe form of muscular dystrophy, caused by mutations in the dystrophin gene, the largest gene in the human genome. This X-linked recessive disorder leads to progressive muscle degeneration, loss of ambulation in early adolescence, and premature mortality due to respiratory or cardiac failure. However, advances in genetic diagnostics have improved our understanding of dystrophin isoforms and their tissue-specific regulation. Duchenne Muscular Dystrophy (DMD) is not just a medical term; it's a devastating reality for countless families worldwide. As this just doesn't lead to progressive muscle degeneration, it strips individuals of their ability to walk during early adolescence and, tragically, often culminates in premature mortality due to respiratory or cardiac failure.

Despite advancements in genetic diagnostics for dystrophin isoforms, curative treatments remain elusive, highlighting the urgent need for innovative research. New evidence suggests that repetitive DNA elements, particularly mirror repeats, play a pathogenic role in neuromuscular disorders by disrupting key transcriptional processes. Given the complexity of the dystrophin gene, these mirror repeats could significantly influence mRNA isoform stability and gene regulation. Our study aims to identify and characterize these mirror repeats in dystrophin mRNA, which may contribute to the understanding of their role in the pathogenesis of Duchenne muscular dystrophy (DMD).

This research seeks to illuminate the mechanisms behind dystrophinopathy and promote new avenues for hope through biomarker discovery and therapeutic interventions. The study aims to identify and characterize these mirror repeats within dystrophin mRNA isoforms, enhancing our understanding of DMD's molecular pathogenesis and guiding future therapeutic strategies.

Keywords: *Mirror Repeats, Neuromuscular Disorder, Muscular Dystrophy, Isoforms.*

SIBPHE-2025/14

Effect of Thermo-Photo Period on The Regulation of Diapause in *Sesamia Inferens* Walk (Lepidoptera-Noctuidae)

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Higher incidence of Diapause in larvae of *Sesamia inferens* was recorded when larvae were exposed to thermo-photo period with cryophase of 20 to 25°C than under thermoperiod during constant darkness.

Temperature is a critical abiotic factor influencing the Diapause stage of insect pest. (Huffaker et al. 1999) Thermo-photo period sets the limit of biological activities in insect such that lower and upper temperature can be estimated for all major life process. (Roy et al. 2002) Effect of temperature on Diapause of larval stage in the case of *Sesamia inferens* studied at four constant temperatures separately (20,25,30,35°C). On the other side, larvae exhibited significantly lower percentage of Diapause when exposed to cryophase lower than 20°C under same thermo-photo periodic conditions. Significantly, shorter time was also needed for Diapause after exposure of larvae to continuous light than to continuous darkness under 35°C.

Thermo-photo period of different amplitude with the same mean temperature clearly indicated that the higher rate of Diapause development inspite of the relatively low temperature.

Rate of Diapause expressed as the reciprocal of thermoperiodic time taken. The more heat received, the faster the rate of reaction in the biological organism occurs.

During each thermo-photoperiod relative humidity maintain 50-60%. The result of each findings can help to provide precise phenological model to forecast the status of the pest in the field of standing crop of Maize.

Keywords: *Cryophase, Noctuidae, Thermo-photoperiod, Diapause.*

SIBPHE-2025/15

Pulsed Electric Field Technology: Advances and Applications in Food Processing and Functional Foods

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Pulsed electric field (PEF) technology has emerged as a promising non-thermal processing method in the food industry, offering an alternative to conventional thermal treatments. This technique applies short, high-voltage pulses to food matrices, inducing electroporation in microbial and plant cells, which enhances microbial inactivation, enzyme deactivation and structural modifications while preserving nutritional and sensory quality. PEF has been successfully employed in the pasteurization of juices and milk, pre-treatment for drying and freezing, extraction of bioactive compounds and modification of starch properties. Furthermore, it enables the valorisation of food industry by-products and promotes bioaccumulation of essential minerals in microorganisms, supporting the development of functional foods. Studies consistently report that PEF-treated products retain higher levels of vitamins, polyphenols and antioxidants compared to thermally processed food, while also reducing energy consumption and processing time. Nevertheless, challenges such as electrode corrosion, uneven electric field distribution and the need for industrial-scale optimization persist. Regulatory acceptance varies globally, but the technology is generally recognized as safe when applied under validated conditions. Overall, PEF represents a sustainable, energy-efficient and consumer-oriented approach to food processing with significant potential to deliver high-quality and functional food products. Continued research and scaling-up are necessary to fully exploit its industrial applications.

Keywords: *Food preservation, microbial inactivation, non-thermal processing, pulsed electric field*

SIBPHE-2025/16

Variation Components (GCV, PCV) of Seed and Yield Traits in Advanced Chickpea Lines

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In plant breeding, components of variance describe how different genetic and environmental factors contribute to the phenotypic variance (observable variation in traits). Phenotypic variance **(**σp2\sigma_p^2σp2**)**: The total observable variation in a trait, which is the sum of genetic and environmental influences. Genotypic variance **(**σg2\sigma_g^2σg2**)**: The portion of variation attributable to genetic differences among individuals. Environmental variance **(**σe2\sigma_e^2σe2**)**: The portion of variation caused by non-genetic factors such as soil, climate, or management practices. Twenty Advanced Breeding Lines were studied to identified the genetic variations by using morphological, quantitative and molecular markers. The genotypic coefficient of variation (GCV %) for days to 50% flowering was 8.81%, while phenotypic coefficient of variation (PCV %) was 9.42%. Days to maturity recorded a GCV of 3.19% and PCV of 3.94%. Plant height exhibited a GCV of 6.19% and PCV of 8.65%, whereas plant height at first fruiting node showed 9.11% and 12.98%, respectively. Stem thickness recorded 9.07% GCV and 13.50% PCV. The number of primary branches per plant exhibited 11.98% GCV and 23.44% PCV, while the number of secondary branches per plant showed 12.85% and 21.65%, respectively.

The number of pods per plant recorded 7.06% GCV and 10.73% PCV, whereas the number of effective pods per plant had 6.38% and 10.36%, respectively. The number of seeds per pod showed a GCV of 10.63% and a PCV of 11.32%. Hundred seed weight exhibited 15.57% GCV and 15.84% PCV. Biological yield per plant recorded 13.74% and 16.63%, while harvest index showed 11.16% and 13.50%, respectively. Seed yield per plant

exhibited the highest variation with 19.39% GCV and 22.53% PCV. The effect of a particular genotype can vary depending on the environmental conditions also, leading to different performance in different environments. This component represents the variation in a trait that is caused by differences in the environment, such as soil conditions, climate, and management practices.

SIBPHE-2025/17

Impact of Microwave Power Levels on Energy Consumption During the Drying of Foamed Mandarin Juice

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In this study, the energy consumption for microwave drying of foamed Nagpur mandarin juice were reported at five microwave power 180, 360, 540, 720 & 900 W. During the study, foamed Nagpur mandarin juice was dried to the final moisture content of 3 to 4 % wb from 89% wb. The best result with regard to energy consumption was found at 660 W microwave power and drying efficiency was obtained from 130 W power among all drying power.

Keywords: *drying, mathematical model, energy consumption, Nagpur mandarin juice*

SIBPHE-2025/18

Traditional Rice Farming and Seed Trait Variability of Landrace Rice of Jhum Cultivators in Mon District, Nagaland, India

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Jhum cultivation, a traditional shifting agricultural system, is the primary livelihood practice of indigenous communities in Northeast India, particularly among the Konyak tribe of Mon district, Nagaland. Despite its socioeconomic importance and role in sustaining food and cultural traditions, systematic documentation of rice diversity and associated community practices remains limited. This study aimed to assess both the socioeconomic dimensions of jhum rice farming and the characterization of traditional rice germplasm conserved in the region. Field surveys were carried out in 24 villages across eight administrative blocks of Mon district, covering 120 farmers through semi-structured interviews. A total of 147 traditional rice accessions were collected, comprising 41 sticky and 106 non-sticky types. Rice was cultivated largely for subsistence, though a small proportion was marketed. Varieties such as *Vumchong*, once reserved for rituals, are now grown for daily use, while *Wang-tsahyan* remains exclusive to *Ahng* (chieftain) clans. Eight accessions were reported to possess medicinal properties. Grain characterization revealed high diversity: thousand grain weight ranged from 9.4 g (*Wangtah*) to 33.2 g (*Solokhabu*); grain length categories included very long (40%), long (24%), medium (32%), and short (2%); grain shapes were medium (68%), slender (17%), and bold (13%). Lemma and palea color were predominantly straw (72%), while kernel color varied from white (97 varieties) to brown, light brown, and speckled forms.

PCA explained 72.1% of variation in the first two components, mainly influenced by grain length, width, and color traits. Cluster analysis grouped the accessions into three major clusters. Findings highlighted existence of rich germplasm diversity and cultural significance of rice, however, challenges for management of biotic and abiotic stress were noticed. These results emphasize the need for conservation, participatory breeding, and policy interventions to sustain food security and enhance the utility of superior landraces in breeding programs.

Keywords*: Traditional agriculture, Jhum, Germplasm diversity, Upland rice*

SIBPHE-2025/19

Understanding Socio-Economic Profile, Motivational Aspects, and Attitudes of Small and Marginal Farmers towards Farmer Producer Organizations in South Gujarat

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The study analyzed the socio-economic profile, motivational factors, and attitudinal orientation of small and marginal farmers towards Farmer Producer Organizations (FPOs) in South Gujarat. Employing a descriptive research design, the study utilized multistage stratified random sampling to select 450 respondents from 15 FPOs. Data were collected through structured interviews and analyzed using descriptive statistics and correlation analysis. The findings showed that most of the respondents were middle-aged (70%), educated up to secondary level (56%), and from medium-sized households (42.67%). About 54 percent were small farmers (2.5–5 acres) and 46 percent marginal farmers. Nearly 37 percent had 10–15 years of farming experience, while 46 percent reported annual incomes of ₹3–5 lakhs. High levels of credit orientation (49.55%), extension contact (43.33%), innovativeness (45.43%), and economic orientation (40%) reflected strong institutional exposure. Motivational analysis highlighted family income enhancement (71.11%), better price realization (69.33%), and quick payment settlements (64%) as key drivers of membership. Collective marketing and bargaining power were valued, whereas input supply and natural resource management ranked lower. Attitudinal analysis revealed 63.78 percent of farmers had a favourable and 14.67 percent a highly favourable perception of FPO services. Recognized benefits included institutional support, risk reduction, and elimination of intermediaries. Constraints included weak input services, limited participatory decision-making, and inequitable benefit distribution. Correlation analysis showed education, media exposure, social participation, economic orientation, and FPO experience were significantly associated with positive attitudes. The study concludes that while FPOs substantially contribute to smallholder empowerment and collective action, strengthening governance mechanisms, input delivery systems, and equity in benefits is critical for enhancing organizational sustainability.

Keywords: *Small and marginal farmers, Socio-economic profile, Motivational factors, Attitudinal orientation, Association*

SIBPHE-2025/20

Pulsed Electric Field Technology: Advances and Applications in Food Processing and Functional Foods

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Pulsed electric field (PEF) technology has emerged as a promising non-thermal processing method in the food industry, offering an alternative to conventional thermal treatments. This technique applies short, high-voltage pulses to food matrices, inducing electroporation in microbial and plant cells, which enhances microbial inactivation, enzyme deactivation and structural modifications while preserving nutritional and sensory quality. PEF has been successfully employed in the pasteurization of juices and milk, pre-treatment for drying and freezing, extraction of bioactive compounds and modification of starch properties. Furthermore, it enables the valorisation of food industry by-products and promotes bioaccumulation of essential minerals in microorganisms, supporting the development of functional foods. Studies consistently report that PEF-treated products retain higher levels of vitamins, polyphenols and antioxidants compared to thermally processed food, while also reducing energy consumption and processing time. Nevertheless, challenges such as electrode corrosion, uneven electric field distribution and the need for industrial-scale optimization persist. Regulatory acceptance varies globally, but the technology is generally recognized as safe when applied under validated conditions. Overall, PEF represents a sustainable, energy-efficient and consumer-oriented approach to food processing with significant potential to deliver high-quality and functional food products. Continued research and scaling-up are necessary to fully exploit its industrial applications.

Keywords: *Food preservation, microbial inactivation, non-thermal processing, pulsed electric field*

SIBPHE-2025/21

Medicinal Plants in Obesity Management: A Low-Cost Approach for Rural Health and Well-being

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Obesity has become a significant global health concern, with rising prevalence even in rural communities due to changing lifestyles, dietary habits, and limited access to modern medical care. Conventional anti-obesity drugs, while effective, are expensive and often associated with adverse effects, limiting their use in low-resource settings. Medicinal plants provide an affordable, accessible, and culturally acceptable alternative for obesity management in rural health care. Plants such as *Garcinia cambogia*, *Camellia sinensis* (green tea), *Curcuma longa* (turmeric), *Zingiber officinale* (ginger), *Trigonella foenum-graecum* (fenugreek), and *Gymnema Sylvester* and many more have demonstrated anti-obesity effects through mechanisms including inhibition of pancreatic lipase, regulation of lipid metabolism, appetite suppression, and enhancement of thermogenesis. These traditional remedies, deeply rooted in ethnomedicinal practices, can be integrated into rural health strategies to provide holistic and cost-effective solutions. However, challenges such as dosage standardization, safety validation, and lack of awareness remain. Strengthening phytochemical and pharmacological studies, alongside community education, may establish medicinal plants as a reliable tool for obesity management in rural health care systems.

Keywords: *Medicinal plants, Anti-obesity, Rural health care, Traditional medicine, Phytochemicals, Obesity management*

SIBPHE-2025/22

A protocol for the establishment of *in vitro* cultures and transient transformation in leaves of *Ficus microcarpa* L.

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Micropropagation from the old tree is a challenging task as the tissue becomes recalcitrant to *in vitro* manipulations. In the present investigation, an attempt has been made to set up tissue culture protocol from nodes of *Ficus microcarpa* L, a suitable candidate for urban landscaping. Nodes collected from rooted-shoots saplings showed better results for culture establishment. BA and TDZ at the concentration of 4.44 and 4.54 µM found suitable. Sprouts, treated with 13.32 µM BA showed higher rate of multiplication (~7 nodes per explant) as well as shoot length (~21.00 mm). Rooting was induced on half strength of MS medium with 0.49 µM IBA, which were hardened later with around 70% of survival rate. A transient transformation assay was also carried out with GUS reporter gene and; a construct to target *FmLFY* gene using CRISPR/Cas9-based genome editing was prepared. The transient transformation protocol was developed to widen the scope of the plant for genetic manipulations either using overexpression or genome editing.

Keywords: *Ficus microcarpa, GUS, LEAFY gene, Micropropagation, Transient Transformation, Urban Landscaping*

SIBPHE-2025/23

Rapid and reliable protocol for the DNA extraction and identification of gender in Date palm seedlings

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Date palm is a dioecious species, bearing fruits in the female plants only. Identification of the gender at the seedling stage can enhance the productivity by transferring only female plants to the field from nursery. Male specific DNA markers can be used to identify gender in date palm cultivars. DNA extraction is a preliminary step for the molecular marker-based analysis. In the present investigation, we have sampled 225 date palm seedlings, extracted DNA, and identified gender using two marker system. Here, we propose hassle-free protocol for the DNA extraction and PCR amplification in date palm cultivars. Out of 225 samples, 106 samples were found to be females (47.11%) and remaining 119 samples (52.89%) were males. Using this protocol, sufficient quantity and quality of DNA were obtained which required no repetition of the DNA extraction and PCR.

Keywords: *Date palm, Dioecious plants, DNA test, Gender identification*

SIBPHE-2025/24

Nutritional Quality and Health Benefits of Microgreens: A Modern Agricultural Crop

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Microgreens are young tender greens, which are consumed to add color, texture or taste to salads and main meals. They can be easily multiplied in small scales and can be grown under indoor conditions, so are easily adopted by controlled environment agriculture, a type of indoor farming particularly important to supply large urban populations. Moreover, microgreens are attracting attention of increasing numbers of consumers due to high nutritional value and certain sensory characteristics. The review of the nutrition quality, sensory analysis, pre and post harvest interventions and health of microgreens are reviewed. Microgreens contain many vitamins (e.g., VC), minerals (e.g., copper and zinc), phytochemicals (e.g., carotenoids and phenolic compounds), which are antioxidants in the human organism. Photosynthetic and metabolic activity of microgreens is affected by pre-harvest interventions, including illumination, salinity stress, nutrient fortification, and natural substrates, which were found to enhance nutritional quality in the microgreens, although species responded variably. Nutrient retention of microgreens can be affected by packaging procedure and storing temperature after harvesting. Microgreens are a novel functional food with anti-inflammatory, anti-cancer, anti-bacterial, and anti-hyperglycemia activity that has been demonstrated both in vitro and in vivo. The phytochemical content of microgreens mainly determines the sensory properties and the overall acceptability and liking of the microgreens. Microgreens have just become popular in the last decades and microgreen research is in its early days. To optimize the pre- and post-harvest process, to enhance and maintain the nutrients and explore the potential health benefits of different microgreens in the prevention and treatment of chronic diseases, further research is justified.

Keywords: *Microgreen, Nutrition, Antioxidant, Preharvest, Postharvest, Health benefits.*

SIBPHE-2025/25

A review on green synthesis of Cobalt, Copper and Titanium dioxide nanoparticles and their Anti Cancerous study

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Green nanotechnology is an eco-friendly method for the biosynthesis of metallic nanoparticles, which are being used due to their unique features and applications in various fields. World Health Organization (WHO) stated that the use of medicinal plants to treat a variety of disorders, such as diabetes mellitus (DM), cancer, HIV infection, hepatitis, tuberculosis (TB), and malaria is very effective. Green synthesis is a cost-effective, environment-friendly, and safe method. There are a wide variety of native plants around the world, owing to their unique physical, chemical, and biological characteristics, used for copper, cobalt and titanium nanoparticle (NP) synthesis, and are potent among all metal nanoparticles. However, as an alternative to several traditional techniques to synthesize nanoparticles, green chemistry has arisen. This review covers the green synthesis of copper, cobalt and titanium metals and its significance as a potent application. All literature surveys will be helpful in terms of further progress as to go from summarizing or concluding data along challenges and future perceptions.

SIBPHE-2025/26

Molecular Characterization of *Begomovirus solanumjoydebpurense* in Chilli Crops.

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Numerous economically important crops are infected by begomoviruses, which are vectored by the whitefly (*Bemisia tabaci*), causing a significant threat to yield and quality. Begomoviruses, which belong to the Geminiviridae family, infect chilli crops with potential visible symptoms such as upward curling and mosaic, foliar deformation, crinkling appearance and stunted growth. Naturally infected leaf samples of chilli were collected and processed for genomic DNA isolation, followed by a PCR assay. The isolated DNA was confirmed for the association of Begomovirus using universal primer as well as begomovirus-specific primers. Upon confirmation of the virus with universal primer, the DNA samples were checked with begomovirus-specific primers, e.g., ToLCJV, ToLCPV, ToLCNDV, PEPLVB, ToLCKV, and ToLCGV. In the PCR assay, most of the samples (>90%) were found positive for the universal primer indicating the presence of begomovirus, and thereafter the samples showed the presence (>70%) of ToLCJV. The remaining other virus species-specific primer was not amplified in PCR. The CP gene of ToLCJV was cloned and sequenced. The virus sequences showed >95% similarity with available sequences of respective viruses in the NCBI database. This study highlights the prevalence of a major leaf curl variance in chilli, and therefore, further research could also help in understanding the incidence pattern of the disease, the influence of the vector, and the management of the viral diseases.

Keywords: *Whitefly, begomovirus, ToLCJV, leaf curl*

SIBPHE-2025/27

Green Genes: Biotechnological Pathways to Soil and Plant Resilience

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The growing pressures of climate change, intensive agriculture, and soil degradation have necessitated innovative approaches to sustain agricultural productivity while preserving environmental health. Biotechnology offers powerful tools to enhance soil quality and plant resilience through targeted genetic, microbial, and molecular interventions. This paper explores recent advancements in biotechnological applications aimed at improving soil fertility, optimizing nutrient cycling, and strengthening plant defense mechanisms against biotic and abiotic stresses. Key strategies include the development of genetically engineered crops with improved root architecture and nutrient uptake efficiency, biofertilizers enriched with plant growth-promoting rhizobacteria (PGPR), and microbial consortia engineered for enhanced nitrogen fixation and phosphate solubilization. Emerging omics-based approaches, such as metagenomics and transcriptomics, are providing deep insights into soil microbiome dynamics, enabling the design of precision interventions for ecosystem restoration. Additionally, CRISPR-Cas gene editing is accelerating the creation of stress-tolerant crop varieties with minimal environmental impact. These innovations not only improve plant growth and yield but also contribute to carbon sequestration, reduced agrochemical dependence, and long-term soil health. Integrating biotechnology with sustainable farming practices has the potential to build climate-resilient agroecosystems, ensuring food security for future generations. The review emphasizes the need for interdisciplinary research, farmer-oriented technology transfer, and regulatory frameworks to maximize the benefits of these green genetic solutions while safeguarding biodiversity and environmental integrity.

Keywords: *Plant Resilience, Biofertilizers, Soil Microbiome, Sustainable Agriculture, Genetic Engineering.*

SIBPHE-2025/28

In-vitro mass production of *Stevia rebudiana* through direct Organogenesis

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Stevia rebaudiana, a natural, non-caloric sweetener source, holds immense potential in food, pharmaceutical, and nutraceutical industries due to its stevioside content. However, commercial cultivation faces significant limitations including low seed germination, genetic variability, and poor scalability through traditional propagation methods. This study focuses on developing a reliable and efficient micropropagation protocol for *S. rebaudiana* through direct organogenesis using nodal explants.

Nodal segments from healthy mother plants were collected and surface sterilized using standardized protocols. Murashige and Skoog (MS) medium supplemented with concentrations of plant growth regulators was used to assess shoot induction, multiplication, and rooting. The optimal combination for shoot multiplication was found to be 2.5 mg/L BAP (6-benzyl amino purine) with 0.25 mg/L NAA (Naphthalene acetic Acid), yielding the highest shoot induction rate (96%). Rooting was best achieved with 1.0 mg/L NAA and 0.1 mg/L BAP, producing healthy root systems suitable for acclimatization.

This protocol ensures rapid multiplication, genetic uniformity, and year-round production of high-quality, disease-free plantlets. The results indicate that in-vitro propagation is a viable alternative to meet the increasing commercial demand for *Stevia rebaudiana*.

Keyword: *Ex-plants, Micropropagation, Organogenesis, Steviocide, Sterilization and acclimatization.*

SIBPHE-2025/29

Sustainable Development in Agriculture

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Sustainable development in agriculture is essential for maintaining long-term agricultural productivity, ecological equilibrium, and the socio-economic welfare of farmers and communities. Agriculture in India constitutes a primary sector, engaging over 50% of the populace, and is vital for food security, rural livelihoods, and economic development. Nonetheless, it encounters numerous obstacles, including resource depletion, climate change, low production, and insufficient infrastructure. Sustainable agriculture techniques seek to tackle these difficulties by advocating environmentally friendly ways that conserve resources, enhance productivity, and guarantee socio-economic advancement for farmers.

Sustainable agriculture is a farming methodology designed to fulfil the requirements of current and future generations, while safeguarding the environment and enhancing the quality of life for agricultural communities. It's founded on the premise that long-term stewardship of natural and human resources is equally vital as short-term economic benefit. An economically and socially sustainable agricultural system allows farms of all scales to achieve profitability and enhance their local economies. This approach aids the next generation of farmers, ensures equitable treatment of workers, fosters racial fairness and justice, facilitates access to nutritious food for all, and prioritises individuals and communities over corporate interests.

Sustainable agriculture is the practice of cultivating crops to enhance human benefit by utilising resources more efficiently while preserving, balancing, and protecting the environment from pollution. India has attained a green revolution through the augmented utilisation of high-yielding variety seeds. The study emphasises sustainability in agriculture by preventing the conversion of arable land to non-agricultural uses, implementing integrated forest management, maintaining genetic resources, and managing marine resources.

Keywords: *Sustainable Agriculture, Sustainable development, Farming, Productivity, Ecological balance, Environment.*

SIBPHE-2025/30

Impact of Hot-Dry and Hot-Humid Seasons on Heat Stress Biomarkers in Indigenous and Crossbred Dairy Cows

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Heat stress (HS) poses a major challenge to dairy cattle, impairing their immune function, endocrine balance, and thermoregulatory efficiency. The present study evaluated cytokine profiles, hormonal dynamics, and body surface temperature responses in 12 indigenous Sahiwal (SW) and 12 crossbred Karan Fries (KF) cows reared under hot-dry (HD; THI = 77.75) and hot-humid (HH; THI = 81.48) conditions. Plasma levels of interleukin-10 (IL-10), tumor necrosis factor-α (TNF-α), interleukin-6 (IL-6), interleukin-1β (IL-1β), cortisol, triiodothyronine (T3), and thyroxine (T4) were quantified using ELISA, while body surface temperatures were recorded through infrared thermography (IRT). Significant ($P < 0.05$) variations were observed between breeds and across seasons. Concentrations of TNF-α, IL-6, IL-1β, and cortisol were markedly higher during HH compared to HD conditions. TNF-α increased by 31.76% in SW and 36.47% in KF cows, while cortisol rose by 44.41% and 47.42%, respectively, from HD to HH conditions. Conversely, thyroid hormones declined significantly ($P < 0.05$) under HH exposure, with T3 and T4 reduced by 25.60% and 36.42%, respectively, with greater suppression in KF cows. Body surface temperatures were consistently higher ($P < 0.05$) in KF cows across all anatomical sites measured. Notably, eye temperature strongly correlated with TNF-α ($r = 0.88$, $P < 0.01$) and cortisol ($r = 0.78$, $P < 0.01$). These findings demonstrate the greater vulnerability of crossbred cows to HS and underscore the value of integrating immune, endocrine, and thermographic indicators for assessing heat-stress resilience in indigenous and crossbred dairy cattle under hot climatic conditions.

SIBPHE-2025/31

Medicinal Potential of *Leptadenia pyrotechnica*: Isolation and Characterization of Indole Alkaloids with Antioxidant and Hepatoprotective Potential

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Leptadenia pyrotechnica Forssk. Decne (LP) is a medicinal shrub widely recognized in traditional medicine for the treatment of various ailments. The present study aimed to isolate, quantify, and characterize alkaloids from the ethanolic stem extract (LPSE) and to evaluate their biological potential. Alkaloids were isolated using thin-layer chromatography (TLC) and column chromatography, quantified by validated high-performance thin-layer chromatography (HPTLC), and structurally characterized through GC-MS, FT-IR, and $^{1}H/^{13}C$ NMR spectroscopy. Quantitative analysis revealed a total alkaloid content of 966.48 ± 24.51 µg/50 g dried extract, with excellent sensitivity and accuracy for the reference markers caffeine, colchicine, and ibogaine. Two novel indole alkaloids namely, Dasycarpidan-1-methanol, acetate (IC2) and Aspidospermidin-17-ol, 1-acetyl-19,21-epoxy-15,16-dimethoxy (IC6), were successfully identified. Both compounds displayed pronounced antioxidant potential, with IC2 exhibiting the lowest IC_{50} values in DPPH radical scavenging and metal chelation assays. *In silico* toxicity predictions using ProTox 3.0, CLC-Pred 2.0, and GUSAR indicated favorable safety margins and potential hepatoprotective relevance. Correlation analysis revealed strong interrelationships between antioxidant capacity and predicted toxicity profiles, highlighting their pharmacological promise. Overall, these findings establish LPSE as a valuable source of bioactive indole alkaloids. The discovery of IC2 and IC6 as potent antioxidant agents provides scientific validation for the ethnomedicinal use of *Leptadenia pyrotechnica* and suggests promising leads for the development of safe and natural hepatoprotective therapeutics.

Keywords: *Antioxidant activity, Hepatoprotective agents, Indole alkaloids, Leptadenia pyrotechnica*

SIBPHE-2025/32

Phytochemical and Antioxidant Assessment of Herbal Combinations

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Polyherbal preparations have been receiving quite a bit of interest over the past few years due to their synergistic effect and to the fact that they have fewer side effects in comparison to one-herb preparations. The objective of the current study was to assess the phytochemical contents and antioxidant properties of two chosen polyherbal formulations, which were referred to as Formulation A and Formulation B. The pre-screening of phytochemical components was done to identify the presence of major bioactive compound such as alkaloids, flavonoids, tannins, saponins, glycosides, phenols, and terpenoids. These phytochemicals were abundant in both formulations, and indicated a diverse and possibly synergistic profile of bioactive compounds. Three in vitro antioxidant potential methods were used: 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging, Ferric Reducing Antioxidant Power (FRAP) and Total Antioxidant Capacity (TAC) with the phosphomolybdenum method. Findings showed that both formulations have considerable antioxidant properties with Formulation B exhibiting a little more capacity to scavenge and reducing power in all three assays. The DPPH assay provided a potent range of IC50 value, and the FRAP and TAC assays supported the ability of the formulations to donate electrons and neutralize the free radicals successfully. The results provide evidence of the therapeutic value of the examined polyherbal preparations, the antioxidant effects of which are due to the availability of a variety of phytochemicals. The study gives a scientific rationale to more pharmacological studies and even the possibility of creating natural antioxidant treatment in accordance with such formulations.

Keywords: *Polyherbal preparations, Phytochemical screening, antioxidant potential, DPPH, FRAP*

SIBPHE-2025/33

To evaluate the anti-cancer potential of the combination of chloroquine and quercetin in human hepatocellular carcinoma cells

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Liver cancer is the leading cause of global cancer mortality and the 5th most common in the US. Factors responsible for liver cancer are smoking, diabetes, obesity, alcohol-related cirrhosis, iron overload, and hepatitis B or C infection. Chloroquine (CQ), an FDA-approved anti-malarial drug, has been shown to enhance the anticancer efficacy of standard anticancer drugs, including Q, in various cancer cell types. A study aimed to explore the chemosensitizing effects of CQ against Q in human liver cancer (HepG2) cells. The study found that a combination of CQ and Q resulted in synergistic cytotoxicity, impaired autophagic flux, and enhanced apoptosis in HepG2 cells. The combination also increased the levels of LC3, P62, and caspase-3 proteins, indicating inhibition of autophagy and induction of apoptosis. The data suggest that CQ, as a repurposed drug, may have the potential to synergize with the anticancer effects of Q in liver cancer cells. Here, I use the Cytotoxicity assay(ALAMAR blue assay), Drug combination therapy effect valuation. The drug-drug interaction between Q and CQ was evaluated according to the Chou and Talalay method. Clonogenic cell survival assay. The process involved a combination of treatments and incubation to ensure accurate results. H2DCFDA (ROS) analysis by fluorescence microscopy, Hoechst and PI analysis by fluorescence microscopy, Western blotting steps include Preparation of lysate from cell culture, Transfer of protein from gel to PVDF membrane, and statistical analysis. In conclusion, the present study demonstrated that CQ could synergistically increase the antitumor effects of

Q on HepG2 cells via the inhibition and activation of apoptotic pathways, as indicated by the marked increase in the expression levels of p62, LC3, and cleaved caspase-3. These key findings showed that CQ and Q co-treatment may be a better therapeutic option for the treatment of liver cancer.

Keywords: *HepG2 human hepatocellular carcinoma cells; Chloroquine (CQ); Quercetin (Q); 2',7'-Dichlorofluorescin diacetate (H2DCFDA); Propidium iodide (PI); Reactive oxygen species (ROS); Combination index (CI); Multidrug resistance (MDR); Polyvinylidene fluoride (PVDF)*

SIBPHE-2025/34

Biotechnological Interventions for the in Vitro Conservation and Propagation of Rare and Endangered Medicinally Valuable Flora

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Endangered medicinal plants represent invaluable reservoirs of bioactive compounds with significant therapeutic and pharmaceutical potential. However, their natural populations are declining at an alarming rate due to habitat loss, overexploitation, unsustainable harvesting, and climate change. Conventional conservation strategies have proven inadequate, highlighting the urgent need for biotechnology-driven approaches to ensure effective preservation and sustainable utilization. This study focuses on in vitro conservation strategies using advanced plant tissue culture techniques integrated with greenhouse acclimatization to safeguard endangered medicinal species. Multiple techniques, including micropropagation, callus induction, somatic embryogenesis, shoot tip culture, synthetic seed production, and slow-growth storage, were optimized to conserve and multiply elite germplasm under controlled laboratory conditions. These methods enable the rapid clonal propagation of genetically uniform, disease-free plantlets while preserving their phytochemical integrity and therapeutic efficacy. Following in vitro regeneration, plantlets were gradually hardened and acclimatized under greenhouse conditions, ensuring a smooth transition to ex vitro environments and significantly improving survival rates. This integration of laboratory-based conservation with greenhouse acclimatization establishes a sustainable propagation framework and supports the potential reintroduction of endangered species into their native habitats. Beyond biodiversity preservation, these strategies ensure a continuous and reliable supply of high-value medicinal resources for pharmaceutical, nutraceutical, and biotechnological applications, thereby reducing dependency on diminishing wild populations. In conclusion, the study proposes an eco-friendly, scalable, and sustainable framework for the conservation of

endangered medicinal plants. By synergistically combining in vitro plant tissue culture techniques with ex vitro acclimatization, this approach provides a promising solution for biodiversity conservation, pharmaceutical resource management, and the long-term sustainable utilization of medicinal flora.

Keywords: *In vitro conservation, medicinal plants, plant tissue culture, micropropagation, greenhouse acclimatization.*

SIBPHE-2025/35

Terminalia arjuna: Bioactive Constituents, Cardioprotective Efficacy, and Standardization Challenges

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Terminalia arjuna is a native Indian medicinal tree that has been used in Ayurvedic medicine for a long time, notably as a cardiotonic to keep the heart working normally. It has been shown to help with a lot of heart and blood vessel ailments. For hundreds of years, it has been used to treat many different illnesses, including heart problems, ulcers, fractures, infections, and more. It has transitioned from an ethnomedicine to contemporary pharmaceutical significance in recent contexts, with its additional attributes, including antioxidant, anti-inflammatory, antibacterial, hypolipidemic, and gastroprotective capabilities, gaining prominence. Phytochemical investigations have produced a comprehensive array of bioactive chemicals, including flavonoids, tannins, triterpenes, and minerals. These bioactive chemicals work together to boost the body's antioxidant enzymes, control the inflammatory cytokines, minimize lipid peroxidation, and protect the endothelium lining. Numerous clinical investigations have validated its efficacy in chronic cardiac disorders, hypertension, angina, and dyslipidemia; nevertheless, these studies remain restricted and have challenges related to standardization. When taken in the right amount, *Terminalia arjuna* has relatively few adverse effects. This review focuses on ethnobotanical knowledge, phytochemical profiles, pharmacological data, therapeutic outcomes, and safety regulations. It also comprises standardization and large-scale manufacturing to make the most of ethnomedicinal data and new trends.

Keywords: *Terminalia arjuna, Cardioprotective, Ethanomedicine, Phytochemistry*

SIBPHE-2025/36

Integrative Formulation and Human Trial Assessment of Polyherbal Therapies for Sustained Blood Glucose Regulation in Diabetic Patients

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Type 2 diabetes mellitus (T2DM) is a Prolonged metabolic disease identified by consistently elevated glucose levels due to defective insulin action /or insufficient insulin production. While conventional pharmacological interventions are effective, they often entail side effects, resistance, and high treatment costs. In this context, polyherbal formulations rooted in traditional medicine offer a holistic, safe, and affordable alternative. The current study intended to establish and clinically assess a standardized herbal combination formulation comprising Aqueous-ethanolic extracts of Gymnema sylvestre, Momordica charantia, Trigonella foenum-graecum, and Syzygium cumini, selected for their well-documented antidiabetic properties. The formulation was optimized for synergistic efficacy and analyzed for bioactive compounds, confirming the detection of flavonoids, nitrogenous compounds such as alkaloids, saponins, and phenolics. Acute toxicity and stability assessments indicated safety and consistency of the product. A 12-week, open-label, prospective clinical trial was conducted on 60 T2DM patients (aged 35–65 years). Key outcome measures encompassed fasting glucose, postprandial glucose levels, and long-term glycemic marker HbA1c. The trial revealed statistically significant improvements: FBG declined from 162.3 mg/dL to 128.1 mg/dL, PPBG from 218.7 mg/dL to 171.5 mg/dL, and HbA1c from 8.1% to 6.9% ($p < 0.01$). No serious adverse effects were observed. Participants also reported improved energy, digestion, and sleep quality. These results suggest that the polyherbal formulation is effective and well-tolerated, offering a promising adjunct or alternative to standard diabetic care. Its multimechanistic action supports long-term glycemic control with minimal side effects. More comprehensive, controlled human trials are recommended to validate these results and establish broader clinical applicability.

Keywords: *- Polyherbal formulation; Type 2 Diabetes Mellitus (T2DM); Glycemic control; Phytochemical analysis; Clinical trial; Herbal medicine.*

SIBPHE-2025/37

Study of New Synthesized Ligands Semi-Empiricalcalculationsforligands

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The AM1 Hamiitonian in the MOPAC package was used to calculate the bond lengths, bond angles, heat of formations, core - core repulsion energies, ionization potential etc. structure of molecules were drawn on the PCMODEL package of Serena software and then were optimized which is used as input for MOPAC. The computed heat of formation, total energy, electronic energy, core-core repulsion energy, ionization potential and other computed results on the basis of AM1 and PM3 methods are given in this paper.Heat of formation value for the Schiff bases by both the methods viz.AM1 and PM3 shows thatit is endothermic and allother computed parameters such as total energy, electronic energy, core-core repulsion and I.P. etc. are given in paper.AM1 methods are used to get reasonably good result [12-14],In this present communication we wish to report the quantum chmecial AM1 and PM3 calculations for 4-NN-bis-2'-cyanoethylaminobenzaldehyde and 2-Methyl-4-NN-bis-2' cyanoethylaminobenzaldehyde schiff bases derived from this aldehyde. The compunds chosen for study are 4CABCA (I), and 2MCABAB (II).

Keywords: *Electronic Structure, Schiff base ligands,semi-empirical AM1 PM3 Calculations*

SIBPHE-2025/38

Chitinolytic Bacteria: A Green Alternative for Soil Health and Plant Protection in Agriculture

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In sustainable agriculture, chitinolytic bacteria have shown great promise as bioresources that provide environmentally friendly alternative for chemical fertilizers and pesticides. These microorganisms act as natural biocontrol agents against pests and phytopathogens because they can break down chitin, a key component of fungal cell walls and insect's exoskeletons. In addition to suppressing pathogens, chitinolytic bacteria improve soil fertility by producing bioactive chemicals that promote plant development and recovering organic matter. Their diverse function enhances crop tolerance to biotic and abiotic stresses, nutrient cycling, and soil microbial diversity. Recent developments in the identification, characterization, and applications of chitinolytic bacteria demonstrate their potential for creating bioformulations that promote environmentally friendly and climate-smart ways of farming. Utilizing these advantageous microorganisms is therefore a sustainable way to protect soil health over the long term, lower chemical usage, and encourage healthy crop production systems.

Keywords: *Plant, Soil fertility, Chitinolytic bacteria, Agriculture, Bio-agents*

SIBPHE-2025/39

Impact of goat breeds on the milk composition at Sikrai tehsil of Dausa district Rajasthan

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Milk is often correctly described as a near perfect food in nature. It contains all five main nutrients: fat, protein, lactose (lactic acid), vitamins and minerals (salt). The research was conducted at the Rukmani Devi College of Agriculture, Dausa district of Rajasthan with a broad objective, as 'Effect of goat breeds on the milk composition under climatic conditions of Sikrai tehsil of Dausa district Rajasthan during 2021-23. 05 milk samples of Sirohi goat and 05 milk samples were collected from the Jakhrana goat breed during the lactation at different villages of Sikrai tehsil of the Dausa district throughout two years. A total of 1200 milk samples were collected from both goat breeds in Sikrai tehsil, with 600 milk samples from Jamunapari goats and 600 milk samples from Sirohi goats. All samples were analyzed by an electronic milk analyzer. Data were analyzed using the ANOVA procedure of RBD (at 5% and 1% significance levels) for the statistical analysis of all milk samples. The specific weight of the Jamunapari goat milk was greater than that of the Jakulana animals. The total fat percentage of both varieties during 2021-23 was 4.61 ± 0.021, solids not fat (SNF) of 8.44 ± 0.030%, and the total solids was 13.32 ± 0.035. The proportion of protein in conditions 2021-22 was greater than that of 2022 – 23 samples of goat milk in both varieties ($p < 0.01$). Statistical analysis also showed that the lactose content in 2021- 22 was 4.25 ± 0.007% for both racial milk from both 23 samples from 2021. The variety had a conspectus effect on the quality of goat milk.

Keywords: *Sirohi goat, Jakhrana goat, Milk composition, Dausa, Rajasthan*

SIBPHE-2025/40

Flavonoid Composition of *Mentha arvensis* L. from the Chatkal State Biosphere Reserve

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Mentha arvensis L. is a perennial aromatic herb belonging to the family Lamiaceae. It is widely distributed across Asia, Europe, and North America, and has long been valued in traditional medicine for its therapeutic properties. The plant is characterized by its high essential oil content, rich in menthol and menthone, as well as diverse secondary metabolites including flavonoids, phenolic acids, and tannins. Recent phytochemical investigations have revealed that *M. arvensis* is particularly abundant in bioactive flavonoids such as rutin, luteolin, kaempferol, gallic acid, and hypolaetin, which contribute to its strong antioxidant, anti-inflammatory, antimicrobial, and antidiabetic activities. Due to this broad pharmacological spectrum, *M. arvensis* has become an important raw material in the pharmaceutical, nutraceutical, and food industries, as well as in modern herbal medicine. This study investigated the flavonoid composition of *M. arvensis* collected from the Chatkal State Biosphere Reserve, Uzbekistan, with emphasis on identifying and quantifying its major compounds. Using phytochemical analysis, five principal flavonoids were isolated: rutin, hypolaetin, gallic acid, luteolin, and kaempferol.

Rutin was found in the highest concentration (341.241 mg/100 g dry weight), establishing it as the dominant constituent of the flavonoid profile. Its abundance highlights the strong antioxidant potential of *M. arvensis*, supporting its role in oxidative stress reduction and cardiovascular protection. Gallic acid was present at 58.098 mg/100 g, contributing to antimicrobial and anti-inflammatory activities, while hypolaetin (6.186 mg/100 g) further reinforced the plant's anti-inflammatory capacity. Luteolin (3.451 mg/100 g) and kaempferol (1.869 mg/100 g), though detected at

lower levels, provide additional health-promoting effects, including antidiabetic, anti-inflammatory, and cytoprotective activities.

Overall, the flavonoid spectrum of *M. arvensis* demonstrates its pharmacological importance, particularly as a natural antioxidant source with complementary antimicrobial, anti-inflammatory, and metabolic regulatory properties. These findings confirm the potential of *M. arvensis* from the Chatkal Reserve as a promising raw material for functional food, nutraceutical, and herbal medicine development.

Keywords: *Mentha arvensis, flavonoids, rutin, gallic acid, luteolin, kaempferol.*

SIBPHE-2025/41

Alterations in the Biological and Enzymatic Properties of Soils under Chemical Contamination

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This study investigates the impact of industrial pollution on the biological properties of irrigated meadow and meadow-alluvial soils in Uzbekistan. Soil samples were collected from areas surrounding major industrial facilities, including Navoiy Nitrogen , HRESS, the Navoi Mining and Metallurgical Combine (NMMC), and cement plants. Samples were taken under sterile conditions using the "envelope" method and analyzed through standard microbiological techniques, such as the soil moisture determination method, ten-fold serial dilution, and surface plating. These approaches enabled the quantification of microbial abundance and the identification of key physiological groups. The results demonstrated that chemical contamination significantly alters both the abundance and diversity of soil microorganisms. Microbial communities varied depending on the pollution source and distance from it. In soils from the Navoiy Nitrogen area, denitrifying bacteria were dominant, whereas in samples collected near HRESS, second-phase nitrifiers and actinomycetes were more abundant. In contrast, soils collected near the NMMC cement plant exhibited a reduction in the overall microbial population, although actinomycetes remained present in relatively high numbers. Heat map visualization of microbial diversity revealed a clear spatial gradient: soils located closer to pollution sources, where the MPC index values were elevated, displayed reduced microbial counts, while soils located 3000 meters or more away from these sources showed an increase in heterotrophic bacteria. This increase is likely due to the enrichment of the plough layer with root biomass and nutrient elements under agricultural practices. Distinct differences were also observed between soil types. In irrigated meadow soils, the abundance of nitrifiers and denitrifiers was comparatively low, while meadow-alluvial soils supported greater populations of actinomycetes, cellulose-decomposing microorganisms, phosphorus-mobilizing bacteria, and nitrogen-fixing species. These findings suggest that meadow-alluvial soils are more resilient to industrial contamination, likely due to their structural and nutrient characteristics that support microbial adaptation. Enzymatic activity was also used as an

indicator of soil biological status. Results indicated that meadow-alluvial soils exhibited higher activity of catalase and urease enzymes compared to meadow soils. Catalase plays a catalytic role in the decomposition of organic matter, while urease participates in nitrogen transformation processes, contributing to ammonium cycling and subsequent plant uptake. In contrast, meadow soils exposed to higher concentrations of heavy metals displayed reduced enzymatic activity, suggesting that contamination inhibits catalytic and immobilization processes. Overall, the study confirms that microbial and enzymatic indicators provide sensitive measures of soil quality, health, and fertility in contaminated environments. The findings highlight the importance of assessing both microbial diversity and enzyme activity when evaluating the ecological impact of industrial pollution. These biological indicators can serve as reliable tools for soil ecological monitoring and for the development of strategies aimed at mitigating the negative effects of heavy metals and industrial emissions on soil ecosystems.

Keywords: *contaminated soils, microorganisms, enzymatic activity, nitrifiers, actinomycetes, soil health.*

SIBPHE-2025/42

Root Morphological Traits of Soybean (Glycine max L.) Varieties and Experimental Lines

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Root system architecture is a critical determinant of soybean (Glycine max L.) performance, as it directly influences soil resource acquisition and plant productivity. Root morphological traits among selected soybean varieties and experimental lines was studied. Significant differences were observed in total root length, root surface area, root projection area, root volume, and root diameter, demonstrating substantial diversity in belowground traits. The obtained results demonstrate that soybean varieties and lines exhibit significant genetic variation in root morphological traits, which reflect not only structural characteristics but also physiological adaptability to environmental stresses (Table 1). Among the varieties, Ehtiyoj showed superior performance with the highest total root length (392.27±90.68 cm) and root projection area (20.77±2.51 cm^2), indicating its ability to exploit larger soil volumes for water and nutrient acquisition. Genetik-1 also performed well (total root length – 364.07±91.27 cm), highlighting its potential as a strong-rooted variety. Sochilmas was distinguished by its root volume (1.28±0.14 cm^3), reflecting robust biomass development. Xotira maintained intermediate values across traits, while Nafis consistently exhibited the lowest values, suggesting weak root development and limited adaptability under stress.

Among the lines, Gen-8 and Gen-9 exhibited the strongest root system development, with superior total root length (456.13±35.04 cm and 422.23±82.83 cm), root surface area (69.80±4.75 cm^2 and 69.03±13.01 cm^2), and root projection area (22.27±1.57 cm^2 and 21.93±4.06 cm^2). These traits indicate enhanced efficiency in soil exploration and resource uptake. Gen-40 had the highest root volume (1.51±0.85 cm^3), demonstrating strong biomass formation. BK-84 showed moderate values but performed well in root surface area (59.53±22.16 cm^2) and root projection area (18.91±7.04

cm²). In contrast, Gen-19 and Gen-26 displayed the lowest performance across traits (total root length – 44.80±5.40 cm and 72.97±17.99 cm; root surface area – 12.27±1.63 cm² and 26.00±3.67 cm²). However, both recorded the highest root diameters (1.14±0.03 mm and 1.18±0.31 mm), which may represent an adaptive strategy under water deficit or mechanical stress through thicker root formation. BK-98 exhibited intermediate performance with a relatively high root diameter (0.98±0.14 mm). Soybean varieties and lines showed clear genetic variation in root morphology. 'Ehtiyoj', 'Genetik-1', 'Gen-8', and 'Gen-9' exhibited superior root traits, while 'Nafis', 'Gen-19', and 'Gen-26' showed weaker development but thicker roots as an alternative adaptation. These findings highlight root architecture as a key trait for selecting high-performing soybean genotypes.

Keywords: *Soybean, total root length, root volume, root surface area*

SIBPHE-2025/43

Investigation of L-Methionine Production Potential of Soil-Isolated Microorganisms

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L-methionine is an essential amino acid for mammals and a key compound in biotechnology, with broad applications in food, cosmetics, and pharmaceutical industries. Despite extensive efforts to establish efficient microbial cell factories for large-scale L-methionine production through fermentation, industrially viable results have not yet been achieved.

In this study, soil and waste samples were collected from the BIPROFED feed protein production facility, transported under sterile conditions, and subjected to microbiological analysis. Serial dilutions of the samples were plated on nutrient agar and incubated at 28–30 °C. A total of 13 microbial isolates were obtained and characterized based on their colony morphology, including pigmentation, elevation, margin, diameter, surface structure, transparency, and texture. Further analyses included Gram staining, sensitivity testing, and phase-contrast microscopy (ZEISS universal microscope) to assess cell shape, motility, size, and division patterns.

To investigate methionine biosynthetic potential, isolates were cultured in M9 minimal medium containing 6.0 g Na_2HPO4, 3.0 g KH_2PO4, 0.5 g NaCl, 1.5 g NH_4Cl, 4.0 g glucose, 0.3 g $MgSO_4$, and 0.02 g $CaCl_2$ per liter. After 2–5 days of incubation, cultures were centrifuged (Eppendorf 5430R, 10 min, 4 °C, 6000–7000 rpm), and supernatants were mixed with ninhydrin reagent (1:1). Samples were then heated in a boiling water bath for 10 min. Isolates capable of methionine synthesis produced an intense violet coloration. As controls, M9 medium supplemented with methionine and a methionine-producing Escherichia coli mutant strain were used.

Overall, eight out of the thirteen isolates demonstrated the ability to synthesize methionine, highlighting their potential for further development as microbial producers of this essential amino acid.

SIBPHE-2025/44

Element Composition of Soil-Grounds Distributed in The Eastern Part of The Dried Aral Sea Bed

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The amounts of elements in the soils forming on the dried bed of the Aral Sea vary. Over several thousand years, these elements were brought by water and, as the water receded over time, accumulated in the lower layers and were also dispersed to different areas along with the sands. The distribution of elements in the eastern part of the dried Aral Sea bed can be seen as follows. The content of elements in the soils was determined using scanning analysis based on a Scanning Electron Microscope (SEM), and the results are presented below (Table 1).

Table 1. SEM Analysis Results of Elements in Soils of Profile Sh-2024-1 in the Eastern Section of the Dried Aral Sea Bed

Element	Massa, % (±%)	Atom % (±%)
C	13.79 ± 0.03	21.16 ± 0.04
O	50.53 ± 0.06	58.22 ± 0.07
Mg	1.88 ± 0.01	1.43 ± 0.01
Al	5.49 ± 0.01	3.75 ± 0.01
Si	14.81 ± 0.02	9.72 ± 0.02
S	0.19 ± 0.00	0.11 ± 0.00
Cl	0.34 ± 0.00	0.18 ± 0.00
K	1.89 ± 0.01	0.89 ± 0.00
Ca	6.69 ± 0.02	3.08 ± 0.01
Ti	0.30 ± 0.01	0.12 ± 0.00
Fe	4.08 ± 0.02	1.35 ± 0.01
Jami	**100.00**	**100.00**

In these soil profiles, the amounts of elements varied. The most abundant elements were oxygen at 50.53%, silicon at 14.81%, and carbon at 13.79%, while the least abundant element was sulfur at 0.19%. The SEM images of the elements are shown below.

Overall analysis revealed the distribution of elements in the eastern part of the dried Aral Sea bed as follows:

Highly distributed elements (Kt > 10): Mg, Ta, Mn

Moderately distributed elements (Kt = 2–10): Be, Co, Fe, Tl, Th, Nb, Ti, Ga, Rb, Li, Cu, Y, P, Na, Ca, K, V, Sn, Zn, Ce, Cs, Sc, Al, Sr, Ni

Elements with distribution close to 1 (Kr ≈ 1): Ba, Cr, Hf, B, Pb, Cd, W, Pt, Re

Sparsely distributed elements (Kt < 1): Sb, Ag, Mo, As, Se, Te, Bi

Acknowledgments

The authors express their gratitude to the Agency for Innovative Development of the Republic of Uzbekistan and the leadership of the Faculty of Biology, who funded this research under the FL-8323102111 project.

SIBPHE-2025/45

Changes in Biological Properties of Saline Soils Under Chemical Contamination

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Soil fertility and ecological stability are directly dependent on its microbiological activity. In saline and chemically contaminated soils, the populations of ammonifiers, phosphorus- and potassium-solubilizing bacteria, actinomycetes, and micromycetes drastically decrease, which negatively affects nutrient cycling and organic matter mineralization. The structural changes occurring in soil microbiocenosis under the influence of various ecological and anthropogenic factors directly affect the general condition and fertility of soils. One of the main determinants of soil fertility is its microbiological activity..This research assessed the abundance and activity of the main physiological groups of microorganisms — ammonifiers, phosphorus- and potassium-solubilizing bacteria, actinomycetes, micromycetes, and bacteria assimilating mineral nitrogen — in soil samples collected from different depths and geographic locations. Six sampling sites were selected. The findings serve as a basis for developing strategies aimed at improving soil fertility, enhancing biological regulation, and ensuring ecological safety. Microbiological analyses revealed that the total number of major physiological groups of microorganisms in the studied soils ranged from 10^3 (1,000) to 10^6 (1,000,000) CFU per gram of soil. Among the analyzed samples, Sample 2 recorded the highest microbial abundance (1.1×10^6 CFU/g), whereas Sample 3 showed the lowest (3×10^3 CFU/g). Based on the overall microbial counts, the samples were ranked in the following order: Sample 2 (1.1×10^6 CFU/g) > Sample 6 (9.8×10^5 CFU/g) > Sample 5 (8.6×10^5 CFU/g) > Sample 4 (5.7×10^5 CFU/g) > Sample 1 (1.6×10^5 CFU/g) > Sample 3 (3×10^3 CFU/g). The abundance of ammonifying bacteria, one of the dominant physiological groups, ranged between 10^3 (1,000) and 10^5 (100,000) CFU per gram of soil. The lowest concentration was observed in Sample 3 (3×10^3 CFU/g). While a similar distribution trend was recorded across the other samples, Samples 2 and 6

showed considerably higher values (9×10^5 CFU/g). According to ammonifier counts, the ranking of the samples was: Samples 2 and 6 > Sample 5 (7.5×10^5 CFU/g) > Sample 4 (4.5×10^5 CFU/g) > Sample 1 (1.3×10^5 CFU/g) > Sample 3. Additionally, species belonging to the *Micrococcus* genus were identified in Samples 1 and 3. Actinomycetes and micromycetes were found only in certain samples and their overall abundance remained below the normal level, indicating limited reserves of organic matter and restricted microbial activity in the soils.The results highlight that microbial activity in Sample 3 was extremely low, reflecting poor soil fertility and possible degradation processes. The restricted occurrence of actinomycetes and micromycetes further demonstrates limited organic matter content and reduced biological activity. It is recommended to conduct additional analyses on soil moisture, pH, and salinity levels, as these factors strongly influence microbial diversity and activity.

Keywords *soil, microorganisms, ammonifiers, actinomycetes, micromycetes, salinization, chemical contamination, microbiological activity.*

SIBPHE-2025/46

Current Challenges and Solutions in Soil Reclamation Around The Kattaqo‘Rg‘On Reservoir: Towards Sustainable Irrigation Practices

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The issue of land reclamation and soil salinity is one of the most pressing challenges for the sustainable development of irrigated agriculture in Uzbekistan. Among the major water bodies, the Kattaqo‘rg‘on Reservoir, located in the Samarkand region, plays a crucial role in supplying water for irrigation, drinking, and ecological balance. However, in recent decades, the soils surrounding this reservoir have undergone significant degradation due to salinization, waterlogging, and declining fertility, primarily caused by inefficient irrigation practices and insufficiently maintained drainage systems. This study aims to investigate the current ameliorative condition of soils in the vicinity of the Kattaqo‘rg‘on Reservoir, identify the main factors contributing to their degradation, and propose practical solutions for improving soil productivity. The research was conducted through a combination of field surveys, laboratory analyses, and agro-meliorative monitoring. Soil samples were collected from different depths and analyzed for salinity levels, water-physical properties, and mechanical composition. Additionally, groundwater depth and mineralization were monitored to understand their impact on soil conditions. Morphological observations were also carried out to identify structural changes and the extent of soil degradation. The findings revealed that a significant portion of the soils near the reservoir is moderately to highly saline, with salinity levels reaching 0.6–0.8% in some areas. The groundwater table was found to be relatively shallow, ranging from 1.5 to 2.0 meters, which facilitates the upward movement of salts through evaporation. Furthermore, the breakdown of soil aggregates and the formation of crusts on the surface were noted as significant barriers to water infiltration and root development. To address these challenges, the paper recommends a set of integrated ameliorative measures. First, the reconstruction and modernization of drainage systems are essential to ensure effective removal of excess water and salts. Second, the adoption of water-saving technologies, such as drip and sprinkler

irrigation, can significantly reduce waterlogging and salinization risks. Third, the application of organic fertilizers and soil conditioners should be encouraged to improve soil structure and nutrient availability. Fourth, systematic leaching practices must be implemented to wash accumulated salts from the soil profile. Finally, the establishment of a continuous meliorative monitoring system using modern geo-information technologies is proposed, which would allow real-time detection of salinity dynamics and more effective decision-making.The results of this research contribute to the scientific understanding of soil reclamation in irrigated lands of Uzbekistan and provide practical guidelines for improving the sustainability of agricultural production around the Kattaqo‘rg‘on Reservoir. The study underscores the importance of integrating traditional amelioration practices with modern technologies to combat soil salinization and waterlogging. By applying the proposed measures, it is possible to restore soil fertility, increase crop yields, and ensure more rational use of water resources. These findings are relevant not only for the Samarkand region but also for other irrigated zones of Central Asia facing similar challenges.In conclusion, the current ameliorative condition of soils around the Kattaqo‘rg‘on Reservoir is unsatisfactory due to salinization, waterlogging, and fertility decline. However, through scientifically grounded and integrated ameliorative strategies, there is significant potential to rehabilitate these soils and enhance agricultural sustainability. The implementation of the proposed measures will contribute to achieving the goals of food security, efficient water management, and sustainable rural development in Uzbekistan.

Keywords: *soil salinity, amelioration, Kattaqo‘rg‘on Reservoir, groundwater, irrigation efficiency, drainage system.*

SIBPHE-2025/47

Effect of Heavy Metals on Soil Porosity

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Heavy metals (Cd, Pb, Cu, Zn) enter soils mainly through industrial emissions, transportation, and agricultural inputs, altering soil physicochemical and structural properties. One of the major negative impacts is the reduction of soil porosity, which leads to disturbances in the soil water–air regime, restricted root development, and reduced ecosystem stability (Zhou et al., 2023; Song et al., 2024).

The study was conducted on soil profiles collected around the Angren Thermal Power Plant. The total porosity of soil layers from 0 to 55 cm was determined using standard laboratory techniques. The results, summarized in Table 1, reveal variations in porosity depending on depth and distance from the pollution source.

Table 1. Total porosity of soil layers at different depths (%)

Soil profile	Depth (cm)	Total porosity (%)
Profile 1 -1.6 km	0–5	45.56
	5–20	45.35
	20–55	41.91
Profile 2 -21 km	0–5	54.81
	5–20	51.85
	20–55	50.92

The data indicate a consistent decrease in porosity with soil depth. In KA№1-1.6 km, porosity decreases from 45.56 % at 0–5 cm to 41.91 % at 20–55 cm. In contrast, KA№5-21 km shows higher values, with 54.81 % at the surface and 50.92 % in the deeper layers. These differences reflect varying anthropogenic pressure and heavy metal contamination levels. High metal concentrations reduce soil aggregate stability, leading to pore reduction (Wang et al., 2022; Huang et al., 2021). As a result, water retention, air exchange, and microbial activity are impaired (Rahman et al., 2020).

The findings demonstrate that heavy metals significantly alter soil porosity and structure, disturbing the water–air balance and degrading soil ecological functions. Therefore, ecological monitoring and remediation approaches such as biochar application and phytoremediation are essential to restore soil properties (Liu et al., 2023; Khan et al., 2024).

SIBPHE-2025/48

Enhanced Microbial-Assisted Phytoremediation Using Hyperaccumulator Plant Consortiums for Multi-Metal Contaminated Agricultural Soils: A Sustainable Approach for the 21st Century

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Heavy metal contamination of agricultural soils poses an escalating global threat, with conventional remediation methods proving economically prohibitive and environmentally destructive. This thesis proposes an innovative enhanced microbial-assisted phytoremediation approach utilizing hyperaccumulator plant consortiums for simultaneous removal of multiple heavy metals from contaminated agricultural soils. Recent research demonstrates that combining specific hyperaccumulator species (Symphytum officinale, Ilex cornuta, and Epipremnum aureum) with targeted rhizosphere bacteria (Sphingomonas, Aminobacter) and biodegradable chelating agents can achieve 75-88% metal removal efficiency while maintaining soil fertility and biodiversity.

Agricultural soil contamination by heavy metals including lead (Pb), cadmium (Cd), zinc (Zn), and copper (Cu) affects over 19.4% of global croplands, threatening food security and human health . Traditional remediation methods such as soil washing and excavation cost $300-2,000 per cubic meter and destroy soil structure permanently. Phytoremediation offers a sustainable alternative, but conventional approaches suffer from long remediation cycles (5-20 years) and limited efficiency for multi-metal contamination . This thesis addresses these limitations through an integrated approach combining recent advances in hyperaccumulator plant selection, microbial enhancement, and chelating agent optimization.

Multi-Species Hyperaccumulator Consortium**.** The proposed system employs a carefully selected plant consortium based on 2024 research findings. Symphytum officinale L. serves as the primary hyperaccumulator, demonstrating exceptional multi-metal uptake capabilities with bioaccumulation factors >1 for Pb, Zn, and Cd [6]. Co-cropping with Ilex cornuta and Epipremnum aureum creates synergistic effects, achieving 13.0-

75.8% Pb elimination, 11.1-38.2% Zn removal, 8.39-88.4% Cu extraction, and 27.8-72.5% Cd reduction when combined with illite application .

Recent discoveries reveal that specific rhizosphere bacteria significantly enhance phytoremediation efficiency. Sphingomonas and Aminobacter species promote plant growth, increase metal tolerance, and improve bioaccumulation through mechanisms including metal chelation, pH modification, and enhanced root development. These bacterial partnerships increase biomass production by 3.6-fold while improving metal extraction efficiency by 8.67-fold compared to non-inoculated controls.

Enhanced microbial-assisted phytoremediation using hyperaccumulator plant consortiums represents a paradigm shift in heavy metal soil remediation. By integrating recent advances in plant biology, microbiology, and soil chemistry, this approach offers a sustainable, economically viable solution for multi-metal contaminated agricultural soils. The methodology's potential for global implementation makes it a critical tool for addressing the growing challenge of soil heavy metal contamination in the 21st century.

SIBPHE-2025/49

Morphological Features of Salt Soils of The Drained Bottom of The Aral Sea

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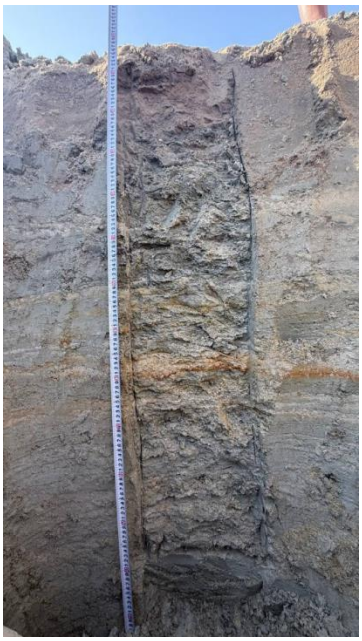
The Aral Sea problem is known throughout the world as an example of environmental degradation caused by human activity. As a result of the retreat of the Aral Sea, its bottom has been exposed, and salt marshes and other types of soil have appeared on it. Plants can grow on soils with different degrees of salinity, except for salt marshes, but plant growth is difficult on salt marshes.



Soil sections were laid to study the specific characteristics of the soil spread over the ‘zero’ mark of the dried-up bottom of the Aral Sea. Section No. 3 (15 July 2025) is located in the area with coordinates (north latitude 44°08.05660‘, east longitude 58°51.08824’) at an altitude of 38.5 metres above sea level (Fig. 1).

0–2 cm. A 2 cm thick saline crust layer has formed on the soil surface. This layer is light brown in colour, slightly moist, of medium density, loamy, and contains small sandy stones, shells, bluish fragments of gypsum, and the remains of decomposing plants. Insects such as ants are found. The transition to the next horizon is clearly defined.

2–24 cm. Sub-crust layer, light brown in colour, with increased moisture content, slightly compacted, loamy in mechanical composition. Plant root systems are rare, and insect traces are few. Shell fragments that have undergone corrosion and are in a fragmented state are often found among the inclusions. The transition to the next horizon is clearly defined.

24–45 cm. The colour is greyish-blue, and the moisture content is high. Medium loamy horizons predominate, with some heavy loamy interlayers. The structure is dusty, compacted in places. Rusty and bluish spots are found among the new formations. Shell inclusions are few in number, and processes of their destruction are observed. There are no plant roots, and traces of insects are becoming increasingly rare. Salt veins are noted. The transition to the next horizon is determined by a change in colour and density.

45–62 cm. A light grey-blue layer with high moisture content and significant compaction forms a dense horizon. The structure is dusty. Among the new formations are gypsum crystals, rusty and bluish spots. There are no plant roots or insect traces. Shell inclusions are rare.

62–64 cm. A dark brown layer, highly moist, medium loamy, medium density. Among the new formations, there are rusty spots. The transition to the next horizon is distinct.

64–72 cm. Light grey-bluish layer, highly moist, medium loamy, medium density. Rusty and bluish spots are noted. No plant roots or insect traces. The transition to the next horizon is determined by a change in colour and density.

72–89 cm. Light grey-blue, highly moist layer, heavy loamy, with strong compaction, dusty structure. Neoplasms are represented by numerous rusty spots. Shells are often found among the inclusions. No plant roots or insect traces are noted.

89–96 cm. Light brown layer with a loose sandy interlayer, moderately moist, slightly compacted. Among the new formations are rusty and bluish spots. Signs characteristic of carbonates are noted.

96–120 cm. Light grey-bluish layer, highly moist, medium loamy, medium density. New formations include rusty spots, small salt crystals and gypsum crystals (rare).

120–135 cm. Light grey-blue layer, with high moisture content, loamy, medium density. Rusty spots are occasionally found among the new formations.

135–150 cm. Light grey-blue, moist, loamy layer of medium density. Rusty spots are occasionally found among the new formations.

150–158 cm. Light grey-blue, moist, loamy layer of medium density. There are a few rusty spots among the new formations; shells are often found among the inclusions.

158–183 cm. Light grey-blue layer, moist, loamy, medium density. There are a few rusty spots among the new formations. Shell inclusions are rare.

Based on the results of the soil profile analysis conducted at the ‘zero’ point of the Aral Sea bottom, it was established that the soils of this area exhibit morphological features characteristic of salt marshes. In the upper part of the profile, a compacted, crusted saline horizon is noted, while sandy and loamy horizons are traced in the lower layers. Shell remains are found at various depths, and processes of their destruction and corrosion are observed. In the 50–90 cm interval, processes of illuviation and gleying are observed, as well as the appearance of rusty and bluish spots and gypsum crystals, which indicates the hydromorphic properties of the soil. In the lower horizons (below 90 cm), there is a decrease in the number of rusty spots, salt crystals and shell remains.

Thus, analysis of the soil profile at the ‘zero’ point of the dried-up bottom of the Aral Sea showed that the soil of this area is a semi-automorphic, sandy, shell-rich, unstable crusted solonchak with signs of gleying in the lower layer.

Acknowledgments

The authors express their gratitude to the Agency for Innovative Development of the Republic of Uzbekistan and the leadership of the Faculty of Biology and ecology, who funded this research under the AL-9424104858: “Creating optimal conditions for plant growth by improving the properties and characteristics of residual-marsh saline soils on the dried bottom of the Aral Sea”

SIBPHE-2025/50

Formation of Hydromorphism in Soils Due To The Activity of Kattaqorgon Reservoir

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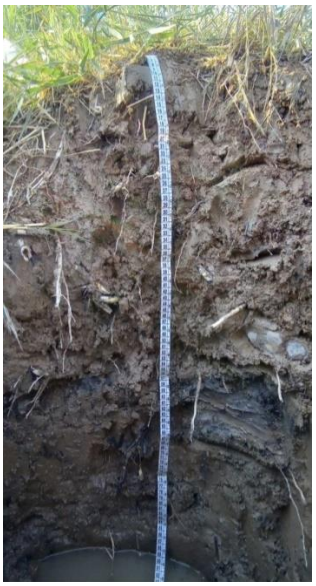
The Kattaqorgon Reservoir is the first reservoir in Uzbekistan. Over the years, its activity has caused the formation of hydromorphism in the surrounding soils, which can be observed in the following soil profile. These soils are irrigated gray-steppe soils, located at an elevation of 490 meters above sea level, 0.4 km northwest of the reservoir. The area was once cultivated but has since been abandoned, now covered with reeds, and the groundwater reached a depth of 78 cm (Figure 1).



0–20 cm: Yellow steppe color, moderately moistened, medium sandy texture, blocky structure, moderately compacted; plant roots and insect traces are present, along with partially decomposed plant residues.
20–32 cm: Yellow steppe color, medium sandy texture, highly moistened, moderately compacted; density increases downward, fine blocky, platy structure; layer contains rust, reddish, and white mottles.

32–50 cm: Light yellow, light sandy texture, highly moistened, strongly compacted; platy and blocky structure; few bluish spots, few plant roots and insect traces; layer contains angular small stones and transitions to the next layer with a color change.

50–62 cm: Bluish-gray, highly moistened, medium sandy texture, with occasional heavy-textured soils; strongly compacted, platy structure; many rust spots; few plant roots, no insect traces; transitions to the next layer with a change in density.

62–78 cm: Bluish-gray, highly moistened, medium sandy texture, with occasional heavy-textured soils; strongly compacted, platy structure; many rust and bluish spots; few plant roots, no insect traces; groundwater reached 78 cm.

From the above, it is evident that the soils around the reservoir are undergoing a strong hydromorphic process. Gleyed and swampy layers are present, limiting the possibility of cultivating crops, while wild plants dominate the area.

Acknowledgments

The authors express their gratitude to the Agency for Innovative Development of the Republic of Uzbekistan and the leadership of the Faculty of Biology and ecology, who funded this research under the IL-9224094166 project

SIBPHE-2025/51

Specific Aspects of Chemical Reclamation of The Saline Soils on The Dried Bottom of The Aral Sea

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After the water receded from the dried bottom of the Aral Sea, a large amount of salts remained, forming these saline soils. One specific characteristic of these saline soils is the high content of readily soluble toxic and non-toxic salts. This impedes the growth and development of plants. Special treatment is required for cultivating plants on these saline soils. The agrochemical properties of such soils differ from standard saline areas and require a specific approach for their reclamation.

Any reclamation method might not be effective on the dried bottom of the Aral Sea. Because it is a unique territory. Transporting materials and applying them presents difficulties, and the applied method must also be economically efficient. Taking this into account, within the framework of project AL-9424104858, we aimed to study the improvement of saline soils for plant growth through the application of various ameliorants.

A comprehensive study of the saline soils on the dried bottom of the Aral Sea revealed that the composition of absorbed cations is very low in calcium and consists mainly of sodium and magnesium, and considering that the amount of carbonate ions is also very low, the goal was set to apply various calcium-enhancing and plant growth-promoting substances.

Individual Testing of Factors

1. Control;
2. $N_{60}P_{40}K_{60}$ kg/ha;
3. Manure 4 т/га;
4. Manure 6 т/га;
5. Phosphogypsum 3 т/га;
6. Phosphogypsum 6 т/га;
7. Lime 3 т/га;
8. Lime 6 т/га;
9. Phosphorite 0,5 т/га;
10. Phosphorite 1,0 т/га;
11. Phosphorite 1,5 т/га;
12. Biochar 4,0 т/га
13. Biochar 8,0 т/га
14. Biochar (LAM enriched) 4,0 т/га
15. Biochar (LAM enriched) 8,0 т/га

Combinatorial Testing of Factors

1. Phosphogypsum 3 t/ha + Manure 4 t/ha;
2. Phosphogypsum 3 t/ha + $N_{60}P_{40}K_{60}$ кг/га;
3. Phosphogypsum 6 t/ha + Manure г 4 т/га;
4. Phosphogypsum 6 t/ha + $N_{60}P_{40}K_{60}$ кг/га;
5. Lime 3 т/га + Manure 4 т/га;
6. Lime 3 т/га + $N_{60}P_{40}K_{60}$ кг/га;
7. Lime 6 т/га + Manure 4 т/га;
8. Lime 6 т/га + $N_{60}P_{40}K_{60}$ кг/га;
9. Phosphorite 0,5 т/га + Biochar 4 т/га;
10. Phosphorite 1,0 т/га + Biochar 4 т/га;
11. Phosphorite 1,5 т/га + Biochar 4 т/га;
12. Phosphorite 0,5 т/га + Manure 4 т/га;
13. Phosphorite 1,0 т/га + Manure 4 т/га;
14. Phosphorite 1,5 т/га + Manure 4 т/га;
15. Phosphogypsum 3 т/га + Biochar 4 т/га;
16. Phosphogypsum 6,0 т/га + Biochar 4 т/га;
17. Lime 3 т/га + Phosphorite 0,5 т/га;
18. Lime 3 т/га + Phosphorite 1,0 т/га;
19. Lime 3 т/га + Biochar (LAM enriched) 4,0 т/га;
20. Lime 3 т/га + Biochar (LAM enriched) 4,0 т/га;

Chemical reclamation methods – such as the application of gypsum, phosphogypsum, lime – allow for the replacement of sodium and magnesium ions with calcium, leaching salts into deeper layers, and improving soil structure. The application of gypsum alone may not be sufficient on the saline soils of the Aral Sea bottom because, along with sodium, magnesium ions are also high. Therefore, chemical reclamation methods combined with organic matter (manure, compost), phosphogypsum, and fertilizers yield effective results.

Conclusion. In the chemical reclamation of the saline soils of the Aral Sea bottom, it is necessary to consider the high content of sodium and magnesium, the limited water regime, and the specific characteristics of the soil structure. Only comprehensive measures – combining chemical, agrotechnical, and biological methods – can lead to the creation of a sustainable agroecosystem.

Acknowledgments

The authors express their gratitude to the Agency for Innovative Development of the Republic of Uzbekistan and the leadership of the Faculty of Biology and Ecology, who funded this research under the project AL-9424104858: "Creating optimal conditions for plant growth by improving the properties and characteristics of residual-marsh saline soils on the dried bottom of the Aral Sea".

SIBPHE-2025/52

Increase in Soil Electrical Conductivity Under The Influence of Pollution

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Today, the rapid development of modern industry, extensive use of chemicals in agriculture, and urbanization processes have led to the contamination of soils with various pollutants (heavy metals, petroleum products, chemical fertilizers, etc.). These substances alter the physical-chemical properties of the soil, increasing its electrical conductivity. An increase in soil electrical conductivity adversely affects plant growth, water-salt balance, and the ecosystem.

The purpose of this study is to identify and assess the changes in the electrical conductivity of soils caused by the contamination of soil with pollutants from household waste disposal sites, including landfills, incineration facilities, and burial grounds. This research aims to analyze the ecological consequences of such pollution. Research has been conducted on the humus content in soils around the Tashkent city landfill located in the Ohangaron district of Tashkent region. The project focuses on the study of the humus content of soils near the Tashkent city municipal landfill in the Ohangaron district of Tashkent region, using an EC meter (electrical conductivity measurement device).

Soil electrical conductivity reflects the rate of ion movement through the soil. The presence of a high concentration of pollutants increases the ion concentration in the soil solution, thus raising its electrical conductivity. The abundance of cations in the soil solution causes an increase in the electrical conductivity (EC). Research showed that soils near the municipal landfill exhibited higher EC values, with a decrease in conductivity as the distance from the landfill increased. At a distance of 0.7 km from the landfill, in the western part of the soils, the electrical conductivity was 297 μS/cm at the 0-20 cm depth and 183 μS/cm at the 20-50 cm depth. In the northern part, the electrical conductivity was 276 μS/cm at the 0-20 cm depth and 172 μS/cm

at the 20-50 cm depth. These findings suggest that pollutants are more concentrated in the upper layers of the soil, while EC decreases in the deeper layers. In the background area, the electrical conductivity was 184 μS/cm at 0-20 cm and 172 μS/cm at 20-50 cm depth. This indicates that the higher electrical conductivity of soils in the vicinity of the landfill is a result of long-term exposure to pollutants.

Scientific sources also show that soils contaminated with heavy metals (e.g., lead, cadmium) have 2-3 times higher electrical conductivity compared to cleaner areas. Pollutants that are prone to leaching, especially nitrates and phosphates, further increase electrical conductivity as they move with groundwater. Excessive electrical conductivity (e.g., greater than 4 dS/m) negatively affects root activity in plants.

In conclusion, it is necessary to regularly monitor and remediate soils near household landfills from pollutants and control electrical conductivity levels. Additionally, the use of chemicals should be limited, alternative ecological technologies should be introduced, and soil remediation methods such as bioremediation and phytoremediation should be employed to clean polluted soils.

Acknowledgments

The authors express their gratitude to the Agency for Innovative Development of the Republic of Uzbekistan and the leadership of the Faculty of Biology, who funded this research under the AL-8624042553 project.

SIBPHE-2025/53

Changes in Humus Content of Soils Polluted By Household Waste

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In recent years, the growth of urbanization and population density has led to a sharp increase in the volume of household waste. Improper storage or disposal of waste in landfills negatively affects ecological systems, particularly the soil environment. Humus in the soil is a crucial factor in determining its fertility and is the result of the decomposition of organic matter. The accumulation of household waste and its penetration into the soil leads to changes in both the quantity and quality of humus.

Research has been conducted on the humus content in soils around the Tashkent city landfill located in the Ohangaron district of Tashkent region. The research focused on soils surrounding the Tashkent city household waste landfill located in the Ohangaron district of Tashkent region. The objective of the study was to determine changes in humus content in soils polluted by household waste and evaluate the effects on soil fertility.

Control samples were taken from natural soils unaffected by waste. Soil samples were collected from the southern, eastern, northern, and western parts of the landfill area. Humus content was determined using the N. Tyurin method.

Typical sierozem (gray) soils, both irrigated and rain-fed, are common around the landfill. It was found that in soils polluted with waste, the humus content increased by 20–40% compared to control soils. The deposition of ash particles, produced from the decomposition and burning of waste, onto surrounding soils due to natural factors contributes to the increase in “technogenic” carbon in the soil.

In samples from the southern part of the landfill, humus content in the top 0–14 cm soil layer reached 4.16%, decreasing to 0.80% in deeper layers. These samples were taken from a distance of 1.0 km from the landfill, while control samples were taken from 3.0 km away. In control soils, humus levels decreased from 1.23% in the top layer to 0.92% in the lower layers. The elevated humus levels near the landfill suggest the presence of increased technogenic carbon.

In the western zone of the landfill, at a distance of 1 km, humus content was 3.22% in the 0–15 cm topsoil layer, and 1.32% at depths of 30–50 cm. In the eastern zone, humus reached 4.89% in the top 0–14 cm layer, and decreased to 0.72% in the lower layers. The elevated humus in the eastern zone may be attributed to wind direction carrying particles toward this area.

As the level of pollution increases, the biological activity of the soil tends to decrease. In some cases, surface accumulation of organic waste leads to a temporary increase in humus content, but this effect is not permanent.

Conclusion: Changes in humus content due to the impact of household waste lead to a decline in soil fertility. Proper waste management, including recycling and composting, is essential for preserving soil humus content. This issue requires heightened attention within the framework of environmental monitoring and ecological protection policies. The high carbon content in soils near landfills can be explained by the dispersion of ash and other pollutants through wind and water from the landfill area into the surrounding environment.

Acknowledgments

The authors express their gratitude to the Agency for Innovative Development of the Republic of Uzbekistan and the leadership of the Faculty of Biology, who funded this research under the AL-8624042553 project.

SIBPHE-2025/54

The Relationship Between Soil Fertility Level and Mechanical Composition

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Our research was conducted on soils from the Piskent district classified into four fertility levels: good (77 score), above average (65 score), average (52 score), and below average (46 score). In each soil layer, the mechanical composition was analyzed according to the proportions of coarse sand (0.05-0.01 mm), medium sand (0.01-0.005 mm), fine sand (0.005-0.001 mm), clay (<0.001 mm), and physical clay (<0.01 mm). The soil mechanical composition was determined using the method of N.A. Kachinskiy and the "ISO/TC 190 Soil Quality" standard. Within the scope of the study, the particle size distribution was established as a percentage composition. Additionally, measurements were taken from various soil horizons ranging from 0–25 cm to 127–143 cm, and relevant data were collected.

The study area primarily consists of irrigated typical gray soils cultivated with cotton. The parent material in this region includes loess and loess-like deposits. Although the piedmont terrain exhibits complex morphology, the oasis relief is relatively flat with a wavy pattern. In terms of mechanical composition, these soils are characterized by medium sandy texture and moderate porosity, with a clearly distinguishable carbonate horizon.

The soil profile is located on the upper flat part of the slope and remains unaffected by erosion. Soils with a fertility rating of 77 bonitet points, classified as high-quality, exhibit the appearance of lime particles, molds, and glossy spots within the carbonate horizon as one moves downward through the genetic layers of the profile. In these soils, fine sand particles range between 16,7-17,5%, while coarse sand particles vary around 48,5-50,1%. The proportion of medium sand particles constitutes approximately 10,7-11,9%, and the finest clay particles are identified at about 14,7-15,5% throughout the soil profile. The total content of physical clay particles ranges from 42,9 to 44,5% classifying these soils as heavy loams.

In the genetic horizons of soils with a bonitet score of 65 and classified as above average in quality, the proportion of coarse sand particles among physical sand ranges from approximately 43.3% to 48.5%, while fine sand varies between 15.9% and 18.3%. The content of medium sand particles constitutes about 10.3% to 11.1%, and the finest clay particles are detected at levels of 14.3% to 15.9% throughout the soil profile. The total share of physical clay particles is similar to that of high-quality soils with a bonitet score of 77, ranging from 40.9% to 44.5%, classifying these soils as heavy loams.

In soils of average quality with a bonitet score of 52, the proportion of coarse sand among physical sand particles ranges from approximately 48.5% to 51.3%, while the content of medium sand varies between 12.7% and 13.5%. Fine sand constitutes about 17.1% to 18.3%, and the finest clay particles are identified at levels of 15.5% to 16.7% within the soil profile. The total content of physical clay particles ranges from 45.7% to 46.9%, classifying these soils as heavy loams as well.

However, soils with a bonitet score of 46 but classified as below average quality yielded similar results. In the genetic horizons of these soil profiles, the physical clay content in the middle layers ranges from 34.2% to 36.6%, while in the upper layers and up to the parent material, slightly higher values between 40.5% and 46.1% were observed, indicating a texture ranging from medium to heavy loam.

In conclusion, soil mechanical composition is a crucial parameter in crop cultivation and the implementation of agrotechnical measures, as it significantly influences all the aforementioned properties. Based on the results of the study, in the Piskent district, soils classified as good (77 score), above average (65 score), and average (52 score) in fertility exhibit a total physical clay content ranging between 40.9% and 46.9%, and are classified as heavy loams in terms of mechanical composition. In soils with below-average fertility (46 score), the total physical clay content in the genetic horizons of the profiles varies by 6.7% to 10.3% in the middle layers, resulting in a mechanical composition classified as medium to heavy loams.

SIBPHE-2025/55

Root Morphological Traits of Soybean (Glycine max L.) Varieties and Experimental Lines

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Root system architecture is a critical determinant of soybean (Glycine max L.) performance, as it directly influences soil resource acquisition and plant productivity. Root morphological traits among selected soybean varieties and experimental lines was studied. Significant differences were observed in total root length, root surface area, root projection area, root volume, and root diameter, demonstrating substantial diversity in belowground traits. The obtained results demonstrate that soybean varieties and lines exhibit significant genetic variation in root morphological traits, which reflect not only structural characteristics but also physiological adaptability to environmental stresses (Table 1). Among the varieties, Ehtiyoj showed superior performance with the highest total root length (392.27±90.68 cm) and root projection area (20.77±2.51 cm^2), indicating its ability to exploit larger soil volumes for water and nutrient acquisition. Genetik-1 also performed well (total root length – 364.07±91.27 cm), highlighting its potential as a strong-rooted variety. Sochilmas was distinguished by its root volume (1.28±0.14 cm^3), reflecting robust biomass development. Xotira maintained intermediate values across traits, while Nafis consistently exhibited the lowest values, suggesting weak root development and limited adaptability under stress.

Among the lines, Gen-8 and Gen-9 exhibited the strongest root system development, with superior total root length (456.13±35.04 cm and 422.23±82.83 cm), root surface area (69.80±4.75 cm^2 and 69.03±13.01 cm^2), and root projection area (22.27±1.57 cm^2 and 21.93±4.06 cm^2). These traits indicate enhanced efficiency in soil exploration and resource uptake. Gen-40 had the highest root volume (1.51±0.85 cm^3), demonstrating strong biomass formation. BK-84 showed moderate values but performed well in root surface area (59.53±22.16 cm^2) and root projection area (18.91±7.04 cm^2). In

contrast, Gen-19 and Gen-26 displayed the lowest performance across traits (total root length – 44.80±5.40 cm and 72.97±17.99 cm; root surface area – 12.27±1.63 cm² and 26.00±3.67 cm²). However, both recorded the highest root diameters (1.14±0.03 mm and 1.18±0.31 mm), which may represent an adaptive strategy under water deficit or mechanical stress through thicker root formation. BK-98 exhibited intermediate performance with a relatively high root diameter (0.98±0.14 mm). Soybean varieties and lines showed clear genetic variation in root morphology. 'Ehtiyoj', 'Genetik-1', 'Gen-8', and 'Gen-9' exhibited superior root traits, while 'Nafis', 'Gen-19', and 'Gen-26' showed weaker development but thicker roots as an alternative adaptation. These findings highlight root architecture as a key trait for selecting high-performing soybean genotypes.

Keywords: *Soybean, total root length, root volume, root surface area*

SIBPHE-2025/56

Characteristics of the new "shijoat" cotton variety of average and high productivity, indicating productivity potential in severely saline and difficult-irrigated areas.

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Today, in scientific research aimed at improving the economic-price and quality indicators of medium-staple cotton, special attention is paid to the widespread use of wild species. In particular, using hybridization and experimental polyploidy methods, it is important to obtain unique genetically enriched introgressive hybrid forms with different types of resistance to pests and diseases, as well as to create new varieties with high economic and price indicators. [4]. In this regard, one of the urgent tasks is to determine the genetic potential of medium-staple cotton in terms of yield, early maturity, fiber quality, and yield, to improve the indicators of polygenic control of quantitative traits, and to create varieties by widely using wild species with different genomes. It is important to note the importance of studying the biological and economically valuable traits of polyploid species of the Gossypium L. genus preserved in the cotton gene pool collection and creating new medium-fiber varieties by involving their intergenomic introgressive lines in breeding practice.[3]

Therefore, in our long-term experiments, we studied the comparison of the medium-fiber C-654 variety with the T-24/1 model cotton variety based on the use of Gossypium L. hirsutum x (G. thurberi x G. raimondii) hybridization, experimental polyploidy, and a comprehensive assessment of the economic traits of complex three-genome hybrids, as a result of applying methods of long-term selection from a mixture of biotypes. [2] Currently, under market economy conditions, one of the urgent tasks of our breeders is the creation of early-ripening, high-yielding, fiber-rich varieties that meet world standards and are resistant to diseases. It is known that large-fruited varieties are often late-ripening, but due to complex hybridization, their growing season may be shortened. [1]. For the practical solution of these pressing problems, we have been conducting individual breeding research for many years - from morphobiological traits of biotypes in the cotton population to technological fiber quality indicators, taking as a priority the state of results obtained in previous years, that is, the stability of traits. Our experiments were conducted in the "Zangi Ota" experimental field of the

Institute of Genetics and Experimental Plant Biology of the Academy of Sciences of the Republic of Uzbekistan from 2010 to 2023. In fertile gray soils with deep groundwater, the planting rate is 75-80 thousand/ha. When the row spacing is 60 cm, it is necessary to provide for the placement of 6-7 single plants per 1 m, and when the row spacing is 90 cm - 8-9 single plants per hectare. On lands with low fertility, the number of plants per hectare can be increased to 5-7 thousand. In gray soils with deep groundwater, irrigation should be carried out according to the 1-3-1 scheme, and in meadow-bog soils with close groundwater, the number of irrigations should be reduced to a minimum. Timely cultivation of row spacing after irrigation will ensure moisture retention. This ensures good plant development and prevents wilting. In conclusion, it should be noted that, according to the above data, the agrotechnology of the "Shijoat" variety, when carried out correctly and timely, ensures an increase in yield. This variety is recommended for cultivation in large areas in regions with high soil salinity and abundant irrigation, with a plant density of 170-200 thousand plants per hectare, i.e., according to 76 schemes. Created as a result of a comprehensive study of biotypes identified based on population analysis and long-term selection, the Shijoat variety is recommended for cultivation in the regions of the republic with high soil salinity and abundant irrigation: Syrdarya, Jizzakh, Khorezm, Bukhara, Navoi, Kashkadarya regions and the Republic of Karakalpakstan.

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SIBPHE-2025/57

The influence of the arrangement of threads in the fabric structure on the strength properties of textile materials

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In world practice, there is a wide range of activities aimed at applying the latest achievements of science and technology for the modernization and implementation of progressive equipment in textile and sewing enterprises. In this area, among other things, the tasks are set to develop effective technologies and create textile materials with high physical, mechanical and hygienic properties [1]. For this purpose, it is necessary to study the properties and structure of the fabric [2].

The article presents the essence of the developed fabric of reinforced structure for the manufacture of shells of heat-protective packages of products. The use of this textile material of reinforced structure of the heat-protective package allows to increase the reliability, hygroscopicity of the product and the shape stability of the package. The proposed fabric with a reinforced structure has two zones: a typical zone with a plain weave, in the reinforcement zone - 4-shaft satin. At the same time, air permeability decreases in the reinforcement zone.

The structure of a fabric is understood as the nature of the arrangement of its constituent elements – threads and fibers. For a more justified choice of control parameters of the structure, we will consider three main models of the structure: the formation model, the state model, the model of the dependence of the properties of the fabric on the state of its structural elements.Строение ткани является функцией нескольких переменных:

$$C_m = \varphi\ (T_з,\ T_к,\ P_m,\ O,\ Э),$$

where, Tz - the filling characteristics of the fabric (the nature of the original threads, the number of threads per unit length, the type of weave); Tk - the features of the filling parameters of the weaving loom during the production of the fabric (warp and weft tension, the position of the scallop, etc.); Pt - the features of the relaxation of the fabric after removal from the weaving loom, including the friction force between the threads;

O – the nature of the change in the structure of the fabric during finishing; E – the nature of the change in the structure of the fabric during use.

Of those considered above, the main factors controlling the structure of the fabric are the composition and structure of the threads, the number of threads per unit length, the type of weave and the conditions of formation on the loom (tension of the warp and weft threads, the linear value of the overhang, etc.) [3-5].

These factors are the ones that govern the structure of the fabric and determine the essence of the structure and all its parameters, characteristics, indicators. These same factors are the objects of design or the given parameters of the structure.

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SIBPHE-2025/58

Development and Application of A Novel Comparative Method For The Analysis of Leaf and Stem Pubescence in Diverse Cotton Accessions

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The assessment of leaf and stem trichome density in cotton, either manually or using automated software, is a complex and time-consuming process. Therefore, in this study, the density of stem and leaf trichomes was comparatively evaluated using Bourland's rating scales [Bourland, F.M., 2003]. This approach helped to minimize the limitations that arise when trichomes are not evenly distributed.

During the growth period from flowering to maturity, stem pubescence and trichome types were analyzed under field conditions using a hand microscope and an Apexel Phone Macro Lens Digital Microscope. As reference forms, pilose stems (completely covered with trichomes) and smooth stems (glabrous) were identified. Pilose forms were characterized by a uniform distribution of trichomes on leaves and other organs, providing softness and a light-green coloration. In contrast, sparsely pubescent or smooth forms displayed an uneven distribution of trichomes, resulting in a brighter appearance.

In the course of the study, stem and leaf pubescence was examined according to the position of fruiting branches, which were divided into tiers: branches 1–3 as the first tier, 4–6 as the second, 7–9 as the third, and 10–12 as the fourth tier. The newly proposed method allowed the detection of changes in trichome density between stem internodes. The results showed that while the density was relatively uniform at the lower internodes (1–3), distinct differences emerged from the fourth internode upward. This approach provided a more precise understanding of the dynamics of stem pubescence across tiers.

SIBPHE-2025/59

Entomopathogenic Nematodes in Insect Pest Control: A Sustainable Approach

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Entomopathogenic nematodes are tiny roundworms that function as potent biological pest control agents targeting diverse insect species. These advantageous microorganisms hunt down and penetrate soil-inhabiting insects by entering through their natural openings and deploying symbiotic bacterial partners that eliminate the host organism within one to two days. Fourteen distinct strains of *Heterorhabditis indica* were isolated from sugarcane cultivation soils across three districts: six strains (DH2, DH3, DH5, DH13, DH16, and DD7) originated from Meerut; five strains (DH4, DH10, DH12, DH14, and DH15) came from Baghpat; and three strains (DH6, DH9, and DH11) were collected from Shamli. Through morphological and genetic analysis, all strains were confirmed to belong to the originally characterized *H. indica* (Poinar, Karunakar and David, 1992), though displaying minor variations in structural characteristics and measurements. Laboratory and field evaluations assessed the virulence of these strains against three target species: *G. mellonella*, *H. armigera,* and *S. litura*. Every strain achieved 100% mortality across all test subjects using minimal concentrations within 60 hours post-treatment. Lethal concentration analysis at 36 hours revealed species-specific preferences: *G. mellonella* was most susceptible to strain DH11 (requiring only 14.04 infective juveniles for 50% mortality), while *H. armigera* responded best to strains DH14 and DH10 (6.01 and 7.67 IJ respectively), and *S. litura* showed highest sensitivity to DH14 (6.01 IJ/L). Reproductive capacity assessment identified

DD7 as the most prolific strain, generating 433,200 (range: 30,600-522,000), 337,600 (327,000-436,000), and 316,000 (22,200-39,000) infective juveniles per liter in *G. mellonella, H. armigera*, and *S. litura* respectively. Other strains ranked in descending reproductive order: DH2, DH16, DH10, DH14, DH15, DH9, DH13, DH6, DH5, DH13, DH11, and DH4. These nematodes hold significant importance in comprehensive pest management strategies due to their target specificity, absence of toxic residues, and capacity for sustained soil-based protection. Application occurs via conventional irrigation or spraying systems, with optimal activity maintained at soil temperatures ranging from 60-90°F, ensuring versatility for both commercial farming and domestic applications.

Keywords: *Insects; agricultural pest; entomopathogenic nematodes; Heterorhabditis; Steinernema; Integrated pest management; Biological control.*

SIBPHE-2025/60

Comparative Efficacy of Organic Amendments for Enhancing Maize Growth in Lead Contaminated Soil

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Soil contamination by heavy metals has become a major challenge for agriculture and food security worldwide, including Pakistan. Lead (Pb) is one such pollutant and is considered highly toxic, mainly introduced into the environment through anthropogenic sources such as industrial waste, wastewater irrigation, and excessive use of chemicals. When this metal is present in soil, it can badly affect crop growth and reduce food production. Lead is very toxic and dangerous for plants, and it reduces the amount and quality of food that can be grown. The aim of the study was to determine whether organic amendments including farmyard manure, poultry manure, compost, and biochar could reduce the toxic effects of Pb in soil in addition to improving the growth and quality of maize crops. These organic materials are already known for improving soil health, increasing carbon content, and helping plants grow better. In this study, we grew maize plants in pots under two different soil conditions – normal soil and lead-contaminated soil with 400 milligrams of Pb per kilogram of soil. We added each organic amendment (farmyard manure, poultry manure, compost, and biochar) at the rate of 1% to the soil. This was done using a completely randomized design (CRD) with three replications. During the maize growing season, we recorded information on various factors such as plant height, leaf size, growth, chlorophyll content, and general plant health. We also studied how the plants absorbed and moved lead from roots to other parts, and how much of the lead was stored in the plants. Additionally, the physical and biochemical parameters of the plants were also distinguished. Statistix 10 was used to analyze the data and treatment means were compared using the Least Significant Difference (LSD) test at the 5% level. The findings of this research will help us understand which organic material works best to improve maize growth and reduce lead toxicity in contaminated soils. These results can support farmers in growing healthy maize crops even in areas where the soil is polluted with heavy metals. In the future, this knowledge can also be used for organic and sustainable farming, especially in peri-urban areas where pollution is common and safe food production is needed.

SIBPHE-2025/61

Herbal Immunonutrition in Aquaculture: Efficacy of *Tinospora cordifolia* and Polyherbal Diets on Recovery and Growth of *Heteropneustes fossilis*

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Heteropneustes fossilis (H.fossilis), a commercially important freshwater species, is particularly vulnerable to bacterial infections like *Aeromonas hydrophila*. This study aimed to evaluate the efficacy of *Tinospora cordifolia* (*T. cordifolia*) and a multi-herbal formulation (*T. cordifolia*, *Ocimum sanctum*, and *Allium sativum*) as dietary immunostimulants to enhance recovery and growth in diseased *Heteropneustes fossilis*. Diseased fish were segregated into three groups: Group 1 (commercial feed), Group 2(a) (*T. cordifolia* supplementation), and Group 2(b) (multi-herbal diet). Growth performance was assessed using length–weight analysis and linear regression modeling over a 90-day period. Group 1 showed inconsistent and negative allometric growth with low R^2 values over time, indicating poor feed efficiency and disease progression. In contrast, Group 2(a) exhibited consistent positive allometric growth ($b > 1.3$), high R^2 values (>0.83), and complete symptom regression within 25–30 days. Group 2(b) displayed a delayed but ultimately superior response, with a slope of 4.691 and R^2= 0.736 at 90 days. These findings suggest that *T. cordifolia*, either alone or in combination with other herbs, significantly enhances immune recovery, nutrient utilization, and somatic growth. The herbal diets promoted early disease symptom regression, improved length–weight trajectories, and supported theoretical models of immunonutrition. Future research should explore dose optimization and feed palatability for large-scale applications. Herbal immunostimulants offer a sustainable, antibiotic-free alternative for enhancing fish health in intensive aquaculture systems.

Keywords: *Aquaculture, multi-herbal formulation, Dietary immunostimulant, immune recovery, fish health.*

SIBPHE-2025/62

Assessing Air Pollution and Physics applications

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Air pollution has emerged as one of the most critical global environmental challenges, impacting human health, climate, and ecosystems. Assessing air pollution requires a multidisciplinary approach, and physics plays a central role in understanding, monitoring, and mitigating its effects. The physical principles of fluid dynamics, thermodynamics, and particle mechanics explain the transport, dispersion, and deposition of pollutants in the atmosphere. Advanced optical and spectroscopic techniques are employed to detect and quantify gaseous and particulate matter. Remote sensing, aerosol physics, and modeling of atmospheric dynamics provide valuable insights into pollution sources, distribution patterns, and long-term impacts. Furthermore, physics-based innovations such as air quality sensors, filtration systems, and renewable energy technologies contribute to pollution reduction. This integration of physics into environmental science not only deepens our understanding of air pollution but also drives sustainable strategies to address its consequences.

Keywords: *Air Pollution, Atmospheric Modeling, Aerosol Physics, Physics Applications*

SIBPHE-2025/63

Hypoglycemic Effect of Dill Seeds in Type 2 Diabetes

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Anethum graveolens (dill) is a traditional aromatic herb widely used as a food flavoring and herbal medicine for flatulence, indigestion, insomnia, and gastrointestinal complications. Beyond its culinary applications, dill has attracted attention for its pharmacological potential, particularly in diabetes mellitus and cardiovascular disorders. Several studies suggest that dill possesses significant hypoglycemic and antioxidant activities. The bioactive compounds, including flavonoids, alkaloids, and phenolic proanthocyanidins, contribute to improved glucose metabolism, enhanced insulin sensitivity, and reduction of oxidative stress. Experimental findings indicate that extracts from dill flowers demonstrate higher antioxidant activity compared to seeds and leaves. Clinical evidence further supports that dill seed powder supplementation can lower fasting blood glucose levels, improve insulin resistance (HOMA-IR), and reduce the risk of diabetic complications. The mechanism of action is linked to modulation of antioxidant capacity and regulation of genes involved in glucose and lipid pathways. Collectively, these findings highlight Anethum graveolens as a promising functional food and herbal remedy for the prevention and management of type 2 diabetes and its associated metabolic disorders.Recent studies indicate that the consumption of Anethum graveolens (AG) may lower the risk of diabetes and slow the progression of cardiovascular diseases. Evidence from both human and animal research strongly supports its antidiabetic potential. Based on these findings, dill could be recommended as a supportive option in the management of diabetes. However, variations in preparation methods, dosage, duration of use, and possible interactions with other medications need to be standardized ey s wobefore consistent clinical application can be ensured.

Key words *diabetes management,anthem graveolance seeds , hypoglycemic activity, insulin sensitivity*

SIBPHE-2025/64

Cultural Attitudes Toward Waste and the Sociological Impact of Green Waste Management Technologies

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As environmental challenges intensify, green waste management technologies—such as composting systems, recycling automation, and waste-to-energy innovations—are increasingly promoted as solutions for sustainable development. However, the success of these technologies is deeply influenced by cultural attitudes toward waste, cleanliness, and environmental responsibility. This study explores how diverse cultural beliefs and social norms shape the adoption and effectiveness of green waste management technologies across different communities. Drawing on theories from environmental sociology and cultural studies, the research investigates how perceptions of waste as either a resource or a pollutant Influence public engagement with eco-technologies. Through qualitative interviews and case studies in urban and rural settings, the study examines community responses, resistance, and adaptation to these innovations. Findings reveal that while technological solutions are often seen as universally beneficial, their integration is mediated by localized values, trust in institutions, and prior environmental practices. Moreover, the study highlights how cultural stigmas around waste can hinder sustainable behavior, particularly in regions where manual waste work is socially marginalized. This research underscores the need for culturally sensitive approaches to environmental technology deployment and calls for participatory strategies that align technical solutions with the social fabric of communities.

Keywords:- *Environmental, Waste Management, sustainable development, social norms.*

SIBPHE-2025/65

Food safety, Hygiene and health: A multidisciplinary approach

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Food safety, hygiene, and health are interdependent pillars essential for ensuring human well-being, reducing disease burden, and achieving sustainable development. The modern food system is complex, encompassing production, processing, transportation, storage, and consumption, which necessitates a multidisciplinary approach to address emerging challenges. Food safety focuses on preventing contamination by biological, chemical, and physical hazards; hygiene ensures cleanliness throughout the food chain; and health reflects the overall physical, mental, and social well-being of individuals consuming safe and nutritious food.

This multidisciplinary approach integrates expertise from food science, microbiology, nutrition, public health, environmental sciences, supply chain management, and regulatory frameworks. Preventive measures such as Hazard Analysis and Critical Control Points, Good Manufacturing Practices and Good Hygiene Practices play a vital role in minimizing risks associated with foodborne illnesses. In addition, advancements in food safety technologies-including rapid pathogen detection, smart packaging, and cold chain innovations-enhance the integrity and traceability of food products.

Behavioral change communication and consumer education are equally critical to ensure that individuals adopt safe food handling, preparation, and storage practices. Moreover, global challenges such as climate change, antimicrobial resistance, and increased urbanization demand integrated strategies that consider environmental sustainability, ethical sourcing, and equitable access to safe food. Policies, international standards (Codex Alimentarius), and coordinated efforts between governments, industries, and research institutions further strengthen the global food safety net.

The COVID-19 pandemic highlighted the urgency of reinforcing food hygiene and safety protocols to prevent outbreaks and maintain public health resilience. Addressing food safety through a multidisciplinary lens not only reduces the incidence of foodborne diseases but also contributes to improved nutrition, enhanced consumer trust, and the achievement of United Nations Sustainable Development Goals, particularly SDG 2 (Zero Hunger) and SDG 3 (Good Health and Well-being).

Keywords: *Food Safety, Food Hygiene, Good Manufacturing Practices, Good Hygiene Practices, Sustainable Food Systems.*

SIBPHE-2025/66

Impact of Weed Management Practices on Herbicide Phytotoxicity and Growth of Okra

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Weed infestation remains one of the most serious constraints in okra [*Abelmoschus esculentus* (L.) Moench] cultivation during the Kharif season, as unchecked weed growth causes severe yield losses by competing with the crop for essential growth resources such as nutrients, moisture, light, and space. Traditional methods of weed management like hand weeding and intercultural operations, though effective, are labor-intensive, time-consuming, and often uneconomical under large-scale cultivation. In this context, chemical weed management has emerged as a practical and efficient alternative, but its success largely depends on the choice of herbicide, dosage, and timing of application. A major concern with herbicide usage in sensitive crops like okra is the potential phytotoxicity, which can adversely affect crop growth and productivity.

The present study was therefore undertaken to evaluate the response of Kharif okra to various weed management practices with special emphasis on herbicide-induced phytotoxicity. Both pre-emergence and post-emergence herbicides were tested alongside cultural and mechanical methods. Parameters such as seedling vigor, leaf chlorosis, foliar injury, stunted growth, and flowering behavior were carefully recorded to quantify crop safety. Results revealed that certain pre-emergence herbicides, when applied at recommended doses, effectively suppressed weed germination during early growth stages with minimal crop injury. However, higher doses or improper application timings led to temporary leaf yellowing and delayed establishment. Post-emergence herbicides exhibited variable tolerance; in some cases, slight phytotoxic symptoms such as foliar burns and reduced plant height were observed. In contrast, non-chemical practices like black

polythene mulching and mechanical + hand weeding ensured complete crop safety but were relatively less effective in controlling late-emerging weeds. Overall, the findings emphasize that judicious herbicide use at optimal doses can provide efficient weed control with negligible phytotoxicity. Integration of chemical and non-chemical approaches offers a balanced strategy for sustainable weed management in Kharif okra cultivation.

Keywords: *Okra (Abelmoschus esculentus), Weed management, Herbicide phytotoxicity, Kharif season, Integrated weed control*

SIBPHE-2025/67

Innovative Approaches in Crop 1 Department of Agriculture Sciences, MahayogiGorakhnath University Gorakhpur. Arogyadham, Balapar Road, Sonbarsa, Gorakhpur-273007, Uttar Pradesh

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In today's rapidly changing world, ensuring food security has become a global priority, especially under the growing challenges of climate change. Rising temperatures, erratic rainfall, and an upsurge in pests and diseases are severely affecting crop productivity. To address these challenges, the development of resilient and high-yielding crop varieties is essential.

Traditionally, plant breeding methods such as mass selection, hybridization, and pedigree breeding required 14–15 years to deliver a new variety. However, modern speed breeding techniques have significantly reduced this timeline to just 2–3 years (seed-to-seed). By manipulating growth conditions—light, temperature, humidity, CO_2 levels, and photoperiod—crops can be accelerated through multiple generations per year.

This approach not only ensures faster varietal development but also enables improvement in yield, stress tolerance, disease resistance, and nutritional quality. Integration with advanced tools such as CRISPR-Cas9 genome editing further enhances the potential to develop climate-resilient crops.

In India, the first crop speed breeding program will be launched in 2024 at the National Agri-Food Biotechnology Institute (NABI), Mohali, focusing on major crops such as wheat, rice, soybean, pea, and tomato. This breakthrough is expected to play a crucial role in safeguarding future food security by enabling rapid development of improved crop varieties tailored to changing climatic conditions.

SIBPHE-2025/68

Innovative Approaches in Crop Improvement and Food Security

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SIBPHE-2025/69

Honey Bee Immune System: Pathways, Responses, and implications for Apiculture

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Thematic Areas: Advances in animal health: Research breakthrough for enhanced production, reproduction and well-being of animals.

Honey bees are vital to global agriculture as they support food security, preserve biodiversity, and offer pollination services. However, they are finding it more difficulty to survive and stay healthy due to a variety of stressors, including parasites, illnesses, pesticide, malnutrition, and climate change. This situation makes learning about the honey bee immune system even more crucial. The study of honey bee health has recently advanced, providing valuable new insights on how to enhance the general well-being, reproduction, and productivity of the bees. In the field of physiological investigations of the honey bee immune system, scientific research on pathogens and processes is growing. Behavioral strategies like grooming, propolis deposition, and sanitary behavior serve as social immunity at the colony level, reducing the spread of disease and enhancing the queen and brood's changes of reproducing. Innovative strategies includes the use of probiotics and nutritional supplements to boost immunity and colony fitness. Colony resilience and productivity are also greatly enhanced by advancements in hive management, environmental enrichment, and decreased pesticide exposure. When taken as a whole, these scientific developments demonstrate how important it is to enhance honey bee health for apiculture and sustainability of agricultural systems around the globe. Improved reproduction, hive product production, and long-term ecological

sustainability will all be made possible by integrated measures to protect honey bees health, which will be made possible by a thorough understanding of their immune, nutrition, and stress responses. Comparatively speaking to *Apis cerana*, little is known about the humoral and cellular immunological components of *Apis mellifera*. Therefore, the purpose of the paper is to evaluate the scientific developments in the innate immune system's processes and pathogens as well as humoral defensive mechanisms against pathogens in Apis mellifera.

Keywords: *Apis mellifera, honey bee health, immune pathways, colony well-being, reproduction.*

SIBPHE-2025/70

Season wise survey of mosquito fauna of District Yamuna Nagar

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Mosquitoes are one of the most important menaces affecting human populations worldwide. So far, over 3,500 species of mosquitoes have been reported of which 88 are known to transmit diseases to humans and another 243 are suspected to be disease vectors. Mosquitoes belong to the order Diptera and the family Culicidae, while humans are part of the class Mammalia and the order Primates.Important vectors of disease(s) include various species of genera,*Anopheles*, *Aedes*, and *Culex*. The most common diseases that are transmitted by these vectors include malaria, dengue, chikungunya, filaria, etc.Surveillance of mosquito-borne diseases, such as malaria and dengue fever, can provide valuable information on the presence and spread of these diseases. Unfortunately, mosquitoes also play a significant role as vectors for various diseases. Some species transmit pathogens such as malaria, dengue fever, Zika virus, and West Nile virus, posing significant health risks to human populations. This relationship has had a profound impact on human health and has driven research into mosquito control and disease prevention. The study was thus, designed to study theseasonal prevalence of mosquitoes in the Yamuna Nagar district of Haryana. Adult mosquitoes were collected using total catch method via UV light-based mosquito traps of CDC (Kenea et al.,2017) installed in the city houses.The adult mosquitoes were identified and the *Anopheles*, *Aedes* and *Culex* were recorded. The data was analysed and the results of the six-month analysis indicatedthat theCulexgenuswas the most dominant. The maximum number of mosquitoes were found in the August. The dominance of the mosquitoes in the area was primarily due to the prevalence of the Culex genera. The monthly distributions of the mosquitoes appeared to be influenced by high monsoon levels in the region.

SIBPHE-2025/71

Influence of Organic Manures for Enhancing Growth and Vigour of Medicinally Important LKT Species Kamala [*Mallotus philippinensis* (Lam.) Mull. Arg.]

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Mallotus philippinensis (Kamala) is a valuable medicinal and dye yielding tree distributed across tropical and subtropical regions, including India, Sri Lanka, Southeast Asia, Australia, and Melanesia. It holds significant economic and cultural importance, with applications in Ayurvedic, Unani, and Chinese medicine, while its wood, bark, fruits, and seed oil are used for timber, fibre, dyes, and varnishes. Despite its multipurpose value, the species remains underexplored, categorized as endangered in parts of India, and faces propagation challenges due to low seed germination (5-22%), dormancy, and slow seedling growth. To address these constraints, a study was conducted during 2024-25 at the College of Forestry, Navsari Agricultural University, Gujarat, to evaluate the effect of organic manures on seedling growth and vigour. Among the treatments, maximum shoot height (36.62 cm) was recorded in soil: biocompost (4:1, T_9), maximum collar diameter (4.68 mm) in soil: vermicompost (4:1, T_7), and significantly highest number of leaves (9.73) in soil: biocompost (4:1, T_9). Significantly greater total leaf area (529.77 cm²) was observed in soil: poultry manure (2:1, T_4). The significantly highest fresh weight (13.08 g) and dry weight (5.15 g) were recorded in soil: vermicompost (4:1, T_7). Seedling vigour indices revealed the lowest sturdiness quotient (6.44) in control (T_1) and maximum root: shoot ratio (0.60) in soil: biocompost (2:1, T_8), while the seedling quality index significantly peaked at 0.54 in soil: vermicompost (4:1, T_7), which also showed maximum survivability (98.33%). Thus, soil: vermicompost (4:1) proved most effective in enhancing seedling growth and vigour, making it suitable for large scale quality seedling production of *M. philippinensis*.

Keywords: *Growth, Mallotus philippinensis, Organic manures, Seedling production, Vigour*

SIBPHE-2025/72

Conservation and Improvement of Bunelkhandi Goat

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Goat rearing holds significant importance in sustaining the livelihoods of rural households in Bundelkhand, a drought-prone semi-arid region spread across seven districts each of Madhya Pradesh and Uttar Pradesh. Goats, often referred to as the "poor man's cow," are primarily reared by landless and marginal farmers. As per the 20th Livestock Census, Bundelkhand has a goat population of 3.21 million, of which nearly 30% belong to the black coloured goat locally known as Bundelkhandi Local Bundelkhandi goat has been recognised and registered as a distinct breed on January 6, 2025 (Accession number INDIA_GOATS_202_BUNDELKHANDI_06041). These goats are medium to large in size, jet-black in color, with compact cylindrical bodies, pendulous ears, and long legs. Known for their hardiness, Bundelkhandi goats are well adapted to extensive grazing systems and are mainly reared for meat production. To conserve and improve this indigenous breed, the AICRP on Goat Improvement project was initiated at ICAR–Indian Grassland and Fodder Research Institute (IGFRI), Jhansi. Under this program, over 200 households with nearly 4,000 goats have been registered, and systematic data on goat rearing practices and production traits are being collected. The average adult body weight of males and females has been recorded at 37.42 kg and 30.14 kg respectively, with a dressing percentage of 45%. Average milk yield is around 500 g/day, while twinning is observed in about 22% of cases. A nucleus herd is being maintained at ICAR–IGFRI, Jhansi. To enhance growth performance in farmers' flocks, superior bucks are selected and distributed among goat rearers. In addition, training and capacity-building programs are regularly conducted to promote scientific goat farming practices, with the objective of improving productivity and strengthening rural livelihoods in the Bundelkhand region.

Keywords: *Bundelkhandi goat, Bundelkhand region, Livelihoods, Improvement*

SIBPHE-2025/73

Distribution, Abundance And Seasonal Dynamics of Indian Pond Heron (Ardeola grayii) in the Urban landscape of Kota,Rajasthan, India

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Urban wetlands and man-made waterways are becoming increasingly important refuges for waterbirds, yet their seasonal stability within city environments remain less understood. In this study we investigated the distribution, abundance and seasonal changes of the Indian Pond Heron (Ardeola grayii) across five urban sites in Kota, Rajasthan: Right Main Canal, Left Main Canal, Kishore Sagar Lake, Abheda Pond and the Ummedganj Pakshi Vihar Conservation Reserve (UPVCR). Monthly surveys were conducted between November 2024 and August 2025 using standardized point counts and the data were analysed with descriptive and statistical approaches.

The Right Main Canal emerged as the most reliable habitat, supporting more than 100 Indian Pond Herons during the monsoon (June to August) and 45-50 individuals in winter. In contrast, Abheda Pond and UPVCR displayed stronger fluctuations, with counts dropping from 20 individuals in November to only 2 in December. Seasonal averages(mean ± SD; CV%) indicated high variability: Winter 15.7 ± 17.5 (111.7%), Mid - winter 8.9 ± 7.5 (84.9%), Pre - breeding 17.3 ± 21.6 (124.6%), and Breeding/ Monsoon 28.5 ± 57.1(200.6%). Statistical tests confirmed significant differences across sites and seasons, with heron numbers showing a strongly non- random distribution. A negative binomial GLM further revealed that both habitat type and season strongly influenced abundance. Overall, the results suggest that canals provide more stable habitats compared to ponds and lakes, which show high variability. Effective urban conservation strategies should therefore integrate both natural wetlands and managed waterways to sustain heron populations.

Keywords: *Abundance, Ardeola grayii, Canals, Seasonal changes, Urban wetlands.*

SIBPHE-2025/74

Seasonal Incidence of Brinjal Shoot and Fruit Borer, *Leucinodes orbonalis* G.

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The present study was conducted to assess the seasonal incidence of brinjal shoot and fruit borer (*Leucinodes orbonalis* Guenee) in relation to prevailing weather parameters. Data on maximum and minimum temperature, relative humidity, and rainfall were recorded on a weekly basis, along with regular observations on shoot and fruit infestation from transplanting to final harvest. The results indicated that initial infestation was low during the early stages of crop growth, but a gradual increase was observed as the crop advanced. A marked rise in infestation was recorded after 5-6 weeks of transplanting, which coincided with increasing temperature and higher relative humidity, suggesting that these factors were favourable for pest development and multiplication. The infestation was more pronounced during the vegetative phase in shoots and later shifted to the fruits during the reproductive stage, leading to significant yield losses. These findings highlight the importance of timely monitoring and integrated pest management strategies to minimize damage caused by *L. orbonalis* in brinjal cultivation.

Keywords: *Seasonal incidence, brinjal shoot and fruit borer, infestation*

SIBPHE-2025/75

From Soil to Health: Isolation and Characterization of L-Asparaginase Producing Fungi

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L-asparaginase (EC 3.5.1.1) is a clinically important enzyme widely used in the treatment of acute lymphoblastic leukemia due to its ability to hydrolyze L-asparagine and deprive malignant cells of this essential amino acid. Bacterial sources have been extensively exploited, fungal L-asparaginase is gaining attention because of its potential for reduced toxicity, higher stability, and extracellular production. Isolation and characterization of soil fungi capable of producing L-asparaginase and to evaluate their health applications. Soil samples from diverse habitats were processed to obtain pure fungal isolates. Screening for enzyme activity was carried out using plate assays with phenol red indicator, and positive strains were further assessed by quantitative enzymatic assays. Several soil fungi demonstrated significant extracellular L-asparaginase activity, underscoring their potential as alternative therapeutic sources. Soil-derived fungi as promising candidates for sustainable L-asparaginase production and open new avenues for developing safer, efficient enzyme formulations for biomedical use.

Keywords*: L-asparaginase, soil fungi, isolation, characterization, anticancer enzyme.*

SIBPHE-2025/76

Herbal Plants Used in Cosmetics and Cosmeceuticals and Their Benefits Compared to Synthetic Alternatives

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Cosmetics are commercially available products designed to enhance the appearance of the skin. Although the cosmetics industry is closely related to the pharmaceutical and food sectors, consumer expectations in this field are quite distinct. Cosmetic consumers tend to be more discerning, seeking products that are not only safe but also deliver visible benefits to the skin. However, cosmetic regulations state that only pharmaceutical products are permitted to exert systemic effects on the body and skin. This creates a major challenge for the cosmetics industry: to balance these opposing demands by offering products that are both effective and compliant with regulations. As a result, they must develop formulations that are both functional and safe. Among beauty products, natural cosmetics are generally considered safer for use. Cosmeceuticals, which are hybrids of cosmetics and pharmaceuticals, aim to enhance the skin's health and appearance by delivering specific benefits—such as treating acne, reducing wrinkles, or offering sun protection. These products support skin health by promoting collagen production, neutralizing harmful free radicals, preserving the structure of keratin, and ultimately improving skin texture and function.

A wide variety of naturally occurring herbs are used in cosmetic formulations for skincare, hair care, and antioxidant purposes. These herbal plants contain diverse chemical constituents that make them valuable in the development of cosmetic products. Some commonly used plants in cosmeceuticals include *Aloe vera*, *Azadirachta indica* (neem), *Curcuma longa* (turmeric), coconut oil, sunflower oil, *Rhodiola rosea* (golden root),

Daucus carota (carrot), *Ginkgo biloba, Lawsonia inermis* (henna), *Camellia sinensis* (green tea), *Acorus calamus*, *Allium sativum* (garlic), *Alpinia galangal*, *Avena sativa* (oat), *Echinacea purpurea*, *Centella asiatica*, *Symphytum officinale* (comfrey), *Crocus sativus* (saffron), *Vitex negundo*, *Sesamum indicum* (sesame), and *Cicer arietinum* (chickpea), among others.
The paper aims to emphasize the significance of researching herbal cosmetics, explore the various herbs used in their formulations, and discuss their benefits compared to synthetic alternative.

Keywords: *Cosmeceuticals, Medicinal Plants, Skin care, Anti-ageing, Skin protection, Hair care, Antioxidants*

SIBPHE-2025/77

Review on Piriformospora Indica: An endophytic Fungus

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Piriformospora indica, a root-colonizing endophytic fungus of the order Sebacinales, has emerged as a model organism for studying plant–microbe interactions due to its unique ability to be cultured axenically and its broad host range. Unlike conventional arbuscular mycorrhizal fungi, *P. indica* combines symbiotic versatility with ease of laboratory manipulation. It significantly promotes plant growth, biomass accumulation, and nutrient uptake—particularly of phosphorus and nitrogen—while enhancing tolerance to various abiotic stresses, including drought, salinity, heavy metal toxicity, and temperature extremes. In addition, *P. indica* induces systemic resistance against a wide array of plant pathogens by modulating phytohormonal signaling pathways, enhancing antioxidant enzyme activities, and regulating stress-responsive gene expression. Given its multifaceted benefits and compatibility with a wide range of crop species, *P. indica* represents a promising biofertilizer, bioprotectant, and sustainable alternative to chemical inputs in modern agriculture. This review synthesizes recent advances in understanding the physiological, molecular, and biochemical mechanisms underlying *P. indica*-mediated plant growth promotion and stress resilience.

Keywords: *Endophytic Fungus, Arbuscular Mycorrhizal Fungi, Biofertilizer, Bioprotectant*

SIBPHE-2025/78

In-vitro propagation from node explants of *Abrus precatorius* L.- An important medicinal plant

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Abrus precatorius L., commonly known as Rosary pea, is a medicinally significant legume widely used in traditional systems of medicine. Despite its therapeutic value, large-scale propagation of the plant is limited due to poor seed germination, seed coat dormancy, and the presence of the highly toxic protein abrin. *In vitro* propagation techniques offer a viable alternative for its rapid and disease-free multiplication, conservation, and sustainable utilization. Nodal explants and leaf explants of *Abrus precatorius* were cultured on Murashige and Skoog (MS) medium supplemented with BAP, KIN and TDZ for shoot regeneration. *In vitro* shoot regeneration was achieved greatest on BAP from node explants. The highest shoot multiplication was obtained from nodal segment as well on MS medium fortified with 0.5 mg/l concentration of BAP enhanced number of shoots with good height. The microshoots raised *in vitro* were subjected to rooting on ¼ MS medium with auxins (IBA and NAA). Maximum root initiation was found at the concentration of 1 mg/l IBA. Regenerated plantlets with well developed shoots were successfully transferred to sterilized jute compost moistened with ¼ MS salt were hardened successfully under mist house conditions.

Keywords: *Abrus precatorius, medicinal significant, MS medium, Growth hormones, node explant, micropropagation*

SIBPHE-2025/79

Assessment of Anthropogenic Influences on Water Quality in Surwal Dam Reservoir, Rajasthan

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Water quality is a vital indicator of ecosystem integrity and human well-being, shaped by natural and anthropogenic drivers. This study assessed the anthropogenic impacts on water quality using physico-chemical characteristics during September 2024–August 2025. Key parameters analysed included pH, EC, TDS, hardness, major ions, DO, BOD, COD, nitrates, and phosphates, with results compared against BIS and WHO standards. While most parameters (pH, TDS, EC, nitrates) remained within permissible limits, elevated BOD, COD, and reduced DO indicated organic and chemical loading, primarily from wastewater and effluents. Phosphate levels consistently exceeded the CPCB threshold (0.1 mg/L), signifying nutrient enrichment from sewage, detergents, and agricultural runoff, posing eutrophication risks. The Water Quality Index (WQI) classified the reservoir within the moderately polluted category. The findings highlight that anthropogenic pressures influences water quality in the reservoir, suggesting the need for sustainable wastewater management and regular monitoring to safeguard aquatic health and water utility.

Keywords **-** *Water quality, BOD, COD, BIS, WHO, Anthropogenic effect*

SIBPHE-2025/80

Technology Use in Agriculture

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The use of technology in agriculture has transformed traditional farming into a more efficient, productive, and sustainable sector. Modern tools such as precision farming, drones, artificial intelligence (AI), Geographic Information Systems (GIS), and Internet of Things (IoT) devices enable farmers to monitor soil health, crop growth, and weather conditions in real-time. These innovations help optimize resource utilization, reduce input costs, and increase crop yields while minimizing environmental impact. Moreover, advancements in biotechnology, automated irrigation systems, and smart machinery have made agriculture more resilient to challenges like climate change and population growth. The integration of digital platforms and mobile applications further empowers farmers by providing market access, weather forecasts, and advisory services. Overall, technology-driven agriculture holds significant potential to ensure food security, promote sustainability, and support rural livelihoods in the 21st century.

SIBPHE-2025/81

Organic Food and Public Health

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Organic food has attracted increasing global attention due to its perceived benefits for health, environment, and sustainability. This paper explores the relationship between organic food and public health, focusing on reduced pesticide exposure, potential nutritional advantages, and the role of organic agriculture in addressing wider public health challenges such as antibiotic resistance and environmental degradation. Although organic food demonstrates significant promise, challenges such as affordability, availability, and the need for further scientific evidence remain important considerations for policymakers and consumers alike.

SIBPHE-2025/82

Integrating One Health for Sustainable Environmental Conservation in Rajasthan

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An essential component of India's public health strategy, the One Health Mission is a cooperative framework that links environmental, animal, and human health to tackle new concerns like vulnerability brought on by climate change, zoonotic infections, and antibiotic resistance. This strategy is essential for sustained environmental conservation in Rajasthan because of the state's dry terrain, hotspots for biodiversity, and growing human-wildlife interactions. In addition, environmental integrity, water availability, and vegetation diversity are all inherently linked to the production and health of livestock. In addition to endangering wildlife, rangeland degradation, wetland shrinkage, and warming temperatures have also made it easier for zoonotic and vector-borne illnesses to spread, increasing the hazards to public health and rural livelihoods.

Rajasthan may achieve sustainable environmental conservation by integrating ecological management, veterinary care, and human healthcare through the One Health goal. Integrative strategies can reduce disease outbreaks, improve climate change resilience, and secure ecosystem services necessary for food and water security. Examples of these strategies include community-based rangeland restoration, conservation of critical habitats, and cooperative surveillance of diseases in humans, livestock, and wildlife. Moreover, scientific monitoring in conjunction with pastoral communities' traditional knowledge systems might enhance adaptive methods for biodiversity protection. Achieving long-term sustainability requires a strong emphasis on cross-sectoral cooperation amongst ecologists, health professionals, legislators, and local communities. The Mission guarantees long-term conservation and protects Rajasthan's delicate ecosystems for coming generations by tackling interrelated threats. In order to protect Rajasthan's natural balance and guarantee the welfare of its people, cattle, and wildlife, the One Health mission is much more than just a health effort; it is a revolutionary conservation approach.

Keywords: *One Health, Biodiversity, zoonotic, environmental conservation, sustainability.*

SIBPHE-2025/83

Study of Major Insect Pests of Mustard (*Brassica juncea*) and Their Management in the Kota District of Rajasthan

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Mustard (*Brassica juncea*) is economically very important l Rabi oilseed crop in Rajasthan's Kota district. This major oilseed crop is extensively cultivated across the Kota region. Despite its significant contribution to agricultural productivity, mustard faces substantial threats from various insect pests that can drastically reduce yield and quality. Mustard fields in this region support a highly diverse insect community composed of pests, natural enemies, pollinators, and other functional groups. Extensive field studies and regional surveys have documented rich entomo-faunal diversity, both in terms of species count and ecological roles. However, mustard productivity is often undermined by diverse insect pests. Understanding the common pests and implementing effective management practices is crucial for sustainable mustard production. Mustard cultivation in Kota region is an essential source of income and nutrition for farmers during the winter (Rabi) season. The study identifies the key insect pests, their seasonal occurrence, and their impact on different crop stages. We found that the pest complex includes major, minor, and occasional pests, with the mustard aphid (*Lipaphis erysimi*) being the most destructive. Other significant pests observed were the painted bug (*Bagrada hilaris*), mustard sawfly (*Athalia lugens proxima*), and diamondback moth (*Plutella xylostella*). Understanding this pest diversity is crucial for developing effective Integrated Pest Management (IPM) strategies to ensure sustainable mustard production in the region.

***Keywords**: Mustard, Brassica juncea, insect pests diversity, pest management, IPM.*

SIBPHE-2025/84

Evaluation of rice genotypes behavior toward the rice blast disease in Burkina Faso

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The goal of this study was to assess the resistance of new rice genotypes, specifically KBR2, KBR4, KBR6, KBR8, KBR9, KBR11, KBR12, KBR13, KBR15, KBR17, KBR28, KBR42, to rice blast disease under real-world conditions in Burkina Faso. The experimental setup was a randomized block implemented at the Karfiguela and Bagre sites and included 03 replications. Endpoints assessed were foliar severity, panicle incidence, and paddy yield. The findings demonstrated that the genotypes KBR17 and KBR42 were resistant to leaf blast disease, while genotypes KBR12, KBR13, and KBR42 were from moderately resistant to resistant to panicle blast disease at both sites. The best yields of paddy rice were recorded by genotypes KBR6 (6.932 T/Ha) at the Karfiguela site and KBR4 (7.042 T/Ha) at the Bagre site. In view of these results, the KBR42 genotype can be disseminated and used as a varietal control method against rice blast in the rice paddies of Burkina Faso. Some genotypes have been shown to be sensitive but exhibit good yields. They could be enhanced through biotechnology to withstand diseases, with the collaboration of specialists in agricultural research.

Keywords: *Oryza sativa L, Magnaporthe oryzae, severity, incidence, Burkina Faso.*

SIBPHE-2025/85

Effects of three essential oils on the phytohormones production against *Magnaporthe oryzae* B.C Couch, a rice blast pathogen.

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This study aimed to evaluate the effect of three essential oil formulations on the defence mechanism of rice plants against *Magnaporthe oryzae*, a rice blast pathogen in Burkina Faso. The experimental set-up was a randomised block of five treatments, including T0, T1, T2, T3 and T4. Rice plants were inoculated with *M. oryzae* on the 14th day after transplanting and essential oils were applied one week after inoculation. The biomass of the rice plants was collected at the full tillering (FT) and paniclar initiation (PI) stages and then sent to the laboratory. The parameters assessed were the levels of signalling and defence molecules. The results showed that for signalling molecules, high ethylene levels were recorded by treatments T2 in FT (6.61 mg EA/g) and T4 in PI (5.59 mg EA/g). The highest salicylic acid contents were obtained by treatment T1 with 106.42 mg/100 g in FT and 96.98mg/100 g in PI. In terms of defensive phytocompound content, treatment T4 recorded the highest levels of polyphenols (256.33 mg EA/100 g) and flavonoids (74.58 mg EA/100 g) in FT. The highest alkaloid and chlorophyll contents were recorded in treatment T2. These were 33.9 mg EA/g in FT and 26.35 mg EA/g in PI for alkaloids, 1.54 g/100 g in FT and 1.78 g/100 g in PI for chlorophyll a and 1.73 g/100 g in FT and 1.77 g/100 g in PI for chlorophyll b. These results are importants because they will enable to control *M. oryzae* in rice fields.

Keywords *: Oryza sativa, Defence mechanism, Magnapothe oryzae, Essential oils, Burkina Faso.*

SIBPHE-2025/86

Effects of Four Essential Oils of Aromatic Plants on Mycelial Radial Growth of *Magnaporthe oryzae* B.C.Couch., a Rice Blast Pathogen in Burkina Faso

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Rice blast, caused by *Magnaporthe oryzae* B.C.Couch is considered as the main fungal disease in rice fields in Burkina Faso. This study aimed to assess the essential oils of *Cymbopogon schoenanthus, Ocimum americanum, Ocimum gratissimum* and *Lippia multiflora* on mycelial radial growth and inhibition rate of the fungus using the contact and fumigation methods. For each essential oil, six doses were used : T0 (0 µl/ml), T1 (0.1 µl/ml), T2 (0.6 µl/ml), T3 (1.2 µl/ml), T4 (1.8 µl/ml) and T5 (2.4 µl/ml). In both tests, two treatments of synthetic fungicides namely Tma (mancozeb) and Taz (azoxystrobin) at recommended doses of 6.67 µl/ml and 3.33 µl/ml respectively. The results showed that in the contact method, essential oils of *L. multiflora, O. americanum,C. schoenanthus* and *O. gratissimum* inhibited 100% (0 cm of diameter) the fungus mycelial radial growth at doses of T3 (1.2 µl/ml), T5 (2.4 µl/ml), T2 (0.6 µl/ml) and T2 (0.6 µl/ml) respectively. As for the fumigation method, oils of *L. multiflora, O. americanum,C. schoenanthus* and *O. gratissimum* inhibited mycelial radial growth of the fungus by 100% at doses of T2 (0.6 µl/ml), T5 (2.4 µl/ml), T4 (1.8 µl/ml) and T3 (1.2 µl/ml) respectively. Mancozeb and azoxystrobin treatments inhibited radial mycelial growth by 100% and 74.1% respectively. These essential oils can be used to control rice blast in the field. The use of these essential oils in rice blast management may also help to reduce environmental pollution caused by synthetic fungicides.".

Key words : *Essential oils, Efficacy, Oryza sativa, Magnaporthe oryzae, Burkina Faso*

SIBPHE-2025/87

Agronomic performances and tolerance to brown spot and aphid attacks of cowpea varieties under the mineral fertilizers' effect in Burkina Faso

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Cowpea (*Vigna unguiculata* L. Walp) is a leguminous crop whose cultivation faces to biotic constraints. In addition, the efficient use of mineral fertilizers is often necessary. This study aimed to evaluate the effect of four (04) mineral fertilizer formulations on the agronomic performance of the cowpea varieties like KVX442-3-25SH (*Komcallé*) and KVX775-33-2G (*Tiligré*) in Burkina Faso. The methodology used is based on apply the experimental design with completely randomized block. Five treatments and five replications were applied: T0 (control), T1 (NPK: 14-23-14); T2 (NPK: 14-18-18); T3 (NPK: 16-16-16) and T4 (NPK: 15-15-15). The parameters used were the number of ramifications, pods and nodules per plant, the number of grains per pod, the weight of dry biomass, the grain yield per pot, the foliar severity of brown spot disease and the incidence of aphid attack. The results showed that treatment T4 recorded the highest performance in terms of the number of pods and nodules per plant, with respective values of 15 pods/plant and 25 nodules/plant for the *Komcallé* variety and 07 pods/plant and 21 nodules/plant for the *Tiligre* variety. Treatments T1 and T4 recorded the lowest leaf incidences of brown spot disease in the *Komcallé* (12.33%) and *Tiligré* (11.06%) varieties respectively. On the other hand, treatments T2 and T3 recorded the lowest incidence of aphid attacks on the *Komcallé* variety (19.67%) and the *Tiligré* variety (21.89%), respectively. In conclusion, mineral fertilizer can contribute to increase cowpea yields in Burkina Faso.

Key words: *Burkina Faso, Cowpea, Mineral fertilizer, Pests, Yield*

SIBPHE-2025/88

New Vistas in Fruit Biotechnology and Post Harvest Management

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Post-harvest and fruit biotechnology are rapidly evolving fields that play a critical role in enhancing the quality, shelf life, and nutritional value of fruits after harvest. Post-harvest technology focuses on the handling, storage, and processing of fruits to reduce losses and maintain freshness during transportation and marketing. Biotechnology complements this by offering advanced tools such as genetic engineering, molecular markers, and tissue culture techniques to develop fruit varieties with improved traits including delayed ripening, enhanced resistance to pathogens, and better post-harvest performance.

Innovations such as the use of RNA interference (RNAi) to suppress ethylene production, the hormone responsible for fruit ripening, have significantly extended the shelf life of perishable fruits like bananas and tomatoes. Similarly, transgenic approaches have enabled the development of varieties with improved texture, flavor, and antioxidant content. Molecular markers aid in the selection of post-harvest resilient traits at early stages of plant breeding, thereby accelerating the development of superior cultivars.

Furthermore, advancements in nanotechnology and smart packaging, integrated with biosensors, have revolutionized post-harvest management by enabling real-time monitoring of fruit quality and spoilage. Such biotechnological interventions not only ensure food security and safety but also contribute to sustainable agricultural practices by minimizing waste and improving supply chain efficiency.

In conclusion, the integration of post-harvest technology with modern fruit biotechnology offers promising solutions to the global challenges of food loss, quality degradation, and marketability of fruits. Continued research and interdisciplinary collaboration are essential to optimize these technologies for large-scale implementation and to meet the growing demands of consumers and the global food industry.

***Key word**: Fruit, Biotechnology, Post Harvest, Quality*

SIBPHE-2025/89

Rising Trends in Post-Harvest Technology of Fruit Crops

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Post-harvest technology plays a critical role in ensuring the quality, safety, and marketability of fruit crops after harvest. With growing global demand for fresh and processed fruits, reducing post-harvest losses and maintaining fruit quality has become increasingly important. Recent trends in post-harvest technology emphasize the integration of innovative, sustainable, and digital solutions that enhance shelf life, minimize waste, and improve supply chain efficiency.

Advancements in packaging technology, such as modified atmosphere packaging (MAP), active packaging, and biodegradable materials, are increasingly being adopted to extend the freshness of fruits while addressing environmental concerns. Cold chain management has also seen improvements with the adoption of IoT-enabled temperature and humidity monitoring systems, ensuring optimal storage and transportation conditions. Furthermore, non-destructive quality assessment tools using near-infrared (NIR) spectroscopy, machine vision, and hyperspectral imaging are becoming more prevalent, allowing for real-time monitoring of fruit quality without causing damage.

Biological and natural post-harvest treatments, including the use of edible coatings, essential oils, and microbial antagonists, are gaining attention as eco-friendly alternatives to chemical preservatives. In addition, smart logistics and block chain-based traceability systems are enhancing transparency, accountability, and efficiency in the fruit supply chain.

The integration of artificial intelligence (AI) and machine learning (ML) in sorting, grading, and predictive modeling of fruit deterioration is revolutionizing the decision-making process for post-harvest management. These technologies not only improve labor efficiency but also help in reducing losses during storage and transit.

In conclusion, the rising trends in post-harvest technology of fruit crops reflect a shift toward sustainable, digital, and precision-based approaches. These innovations hold great potential to reduce post-harvest losses, improve fruit quality, and meet the growing global demand for fresh produce while ensuring environmental and economic sustainability.

***Keyword**: Fruit, Post Harvest Technology, MAP*

SIBPHE-2025/90

Role of Agriculture in Indian Economy

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Agriculture has historically been the backbone of the Indian economy, playing a crucial role in shaping the country's socio-economic structure. Despite rapid industrialization and the growth of the services sector, agriculture continues to support nearly 60% of India's population through direct or indirect employment. It contributes significantly to the national income, food security, and rural development. This sector not only provides raw materials to various industries such as textiles, sugar, and food processing but also influences the performance of other sectors through forward and backward linkages.

The Indian agricultural sector is diverse, encompassing a wide range of crops, climatic conditions, and farming practices. It contributes around 15-18% to the national GDP, and its performance often sets the pace for overall economic growth, especially in rural areas. Government initiatives such as the Green Revolution, Pradhan Mantri Krishi Sinchayee Yojana, and PM-KISAN have aimed to modernize agriculture, improve productivity, and ensure farmer welfare. However, challenges such as fragmented land holdings, dependence on monsoons, low productivity, and market inefficiencies persist.

In recent years, there has been a growing emphasis on sustainable agriculture, agritech innovation, and organic farming to meet domestic and global demands. The integration of technology, better irrigation facilities, and improved access to credit and markets are vital for enhancing agricultural output and farmer incomes. The sector's role is also critical in ensuring food security for the nation's growing population.

***Keyword**: Agriculture, Economy, Organic Farming, Market*

SIBPHE-2025/91

Precision farming in Fruit Crops

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Precision farming represents a paradigm shift in horticultural production systems, integrating advanced technologies to optimize resource utilization, improve productivity, and ensure environmental sustainability. In fruit crops, which are characterized by perennial growth habits, spatial heterogeneity, and high market value, the application of precision agriculture is both challenging and transformative. This research critically examines the adoption of site-specific crop management tools—such as geospatial mapping, remote sensing, Internet of Things (IoT)-enabled sensor networks, variable rate technology (VRT), and decision support systems (DSS)—for enhancing yield, quality, and profitability of fruit production. The study investigates how spatial and temporal variability in soil fertility, microclimate, canopy architecture, and water availability can be precisely monitored and managed to improve resource-use efficiency. Furthermore, it evaluates the role of big data analytics, artificial intelligence, and machine learning models in predicting phenological stages, disease and pest outbreaks, and postharvest quality attributes. Socio-economic implications, including cost-benefit analysis, barriers to adoption, and knowledge dissemination among growers, are critically analyzed. The findings suggest that precision farming in fruit crops not only enhances input-use efficiency and crop resilience to climate variability but also supports traceability, sustainability certification, and export competitiveness. However, widespread adoption requires addressing challenges of technology affordability, interoperability, and farmer training. This research underscores the transformative potential of precision horticulture in aligning fruit production systems with global demands for sustainability, food security, and nutritional quality.

Keywords: *Precision farming, technology, efficiency, management, sustainability.*

SIBPHE-2025/92

Formation and Application of The Enterprise's Innovation Strategy

Dr. Punam Thakur

The article's primary goal is to provide a model for the development and subsequent application of creative strategies in the business, based on a thorough review of the literature and conducted research. The innovative strategy model focuses on developing an efficient system of work using an enterprise's inventions and expertise. The report offers suggestions for the effective application of creative tactics inside the company. Business managers should use these suggestions as a useful instrument for carrying out an innovation plan. Additionally, potential trouble spots have been identified, and managers need to concentrate on resolving these issues while fostering innovation inside the company. The following techniques were employed in the study: methods of comparison, qualitative assessment, semi-structured and structured interviews, observation, document analysis (content analysis), and questionnaires.

Keywords*: innovation, innovation strategy, innovative potential, innovative management*

SIBPHE-2025/93

Youth Engagement and Innovations in Green Technologies

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Youth engagement and innovation in green technology are emerging as critical drivers in the global transition toward sustainable development and climate resilience. This abstract explores how young people are not only advocating for environmental action but are also actively contributing to the creation and implementation of green technologies. Through a combination of education, digital fluency, and entrepreneurial spirit, youth are developing innovative solutions in areas such as renewable energy, sustainable agriculture, waste management, and clean transportation. These contributions are facilitated by increased access to open-source platforms, global collaboration networks, and supportive policy environments. However, challenges remain, including limited funding opportunities, lack of mentorship, and barriers to participation in formal decision-making processes. This paper emphasizes the need for multi-stakeholder partnerships to amplify youth-led green innovations and calls for policy frameworks that integrate youth perspectives in environmental governance. Empowering young innovators today is essential for building a greener, more equitable future.

Keyword: *Innovation, Green Technology, Renewable, Sustainable, Global.*

SIBPHE-2025/94

Harnessing Sustainable Plant Pathology Innovations for Environmental Health and Climate-Resilient Agriculture

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In the context of escalating climate challenges and environmental degradation, plant pathology plays a pivotal role in shaping the future of sustainable agriculture. This abstract explores the latest scientific innovations in plant disease management that align with the dual goals of enhancing crop resilience and protecting environmental health. Emphasis is placed on ecofriendly approaches such as the use of biocontrol agents, botanical pesticides, microbial consortia, and disease-resistant cultivars developed through CRISPR/Cas and RNAi technologies. These innovations significantly reduce the dependency on synthetic agrochemicals, thereby minimizing environmental contamination and safeguarding biodiversity. Additionally, advances in digital plant pathology-including AI-based disease diagnostics, remote sensing, and precision agriculture toolsenable early detection and site-specific management of plant diseases. Such technologies not only improve control efficiency but also reduce the environmental footprint of agricultural practices.

The integration of soil health management, phytobiome research, and host-pathogen interaction studies further reinforces the role of plant pathology in building climate-resilient cropping systems. Case studies and field trials underscore the tangible benefits of these approaches in enhancing both yield stability and ecological balance. This presentation advocates for the broader adoption of sustainable plant disease management strategies and highlights the importance of interdisciplinary research and policy support. Ultimately, plant pathology is positioned not just as a field of disease control, but as a cornerstone of environmentally responsible and climate-smart agriculture.

Keywords: *Biocontrol Agents, Sustainable Agriculture, Environmental Health, Disease Diagnostics, Host-Pathogen Interaction, Eco-friendly Disease Management*

SIBPHE-2025/95

Unlocking Soil Potential: Biotechnological Breakthroughs in Plant Nutrition and Soil Health

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Healthy soils and balanced plant nutrition are the cornerstones of sustainable agriculture and environmental resilience. With the growing need to reduce reliance on chemical fertilizers, biotechnological innovations offer powerful, eco-friendly solutions to improve soil fertility and nutrient availability. These abstract highlights cutting-edge biotechnical strategies that enhance soil health and plant nutrition, focusing on their sustainability and real-world applications. Microbial biotechnology has advanced rapidly, enabling the use of beneficial microbial consortiasuch as nitrogen-fixing bacteria, phosphate-solubilizing microbes, and mycorrhizal fungi-that naturally boost nutrient uptake and support plant growth. Modern genomic and metagenomic tools now allow for precise profiling of soil microbiomes, paving the way for crop- and region-specific microbial formulations. Innovations like biofertilizers, nano-nutrient delivery systems, and geneedited crop varieties with improved nutrient use efficiency are revolutionizing nutrient management. These technologies not only enhance productivity but also minimize nutrient loss, improve soil structure, and support organic matter restoration-key to climate-smart agriculture.

Through selected case studies, this presentation will illustrate the measurable benefits of these technologies on crop yield, soil fertility, and nutrient dynamics. Ultimately, the integration of biotechnology with soil science and agronomic practices is essential to building a sustainable, resilient agricultural future.

Keywords: *Microbial Biotechnology, Soil Microbiome, Gene Editing, Climate-Resilient Farming, Nutrient Use Efficiency, Plant Nutrition, Soil Health*

SIBPHE-2025/96

Organizational Culture and Innovation Strategy Fit: Consequences for Innovation Outcomes

Dr. Shirinaz A. Sayyad

Few studies concurrently assess the relationship between the two multi-dimensional dimensions from a holistic perspective, despite earlier research showing connections between particular innovation strategy types and particular organizational culture components.

We define fit as "profile deviation" based on configuration theory, and we look into how well an organization's innovation strategy and culture mesh. Information was gathered from 183 Chinese businesses. We investigate the theory that higher innovation speed and quality are promoted by a better alignment between organizational culture and innovation strategy.

Our findings demonstrate that within the set of companies using either an exploitative or exploratory innovation strategy, the better the innovation speed and quality, the more similar the organizational culture configurations are to those of the best performers. Innovation pace and quality are not substantially correlated with organizational culture and innovation strategy fit in the group of companies displaying ambidextrous innovation strategy.

There is discussion of the implications for implementing the culture-strategy fit in innovation management.

Keywords*: fit; organizational culture; innovation strategy; innovation speed; innovation quality*

SIBPHE-2025/97

Variation Components (GCV, PCV) of Seed and Yield Traits in Advanced Chickpea Lines

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In plant breeding, components of variance describe how different genetic and environmental factors contribute to the phenotypic variance (observable variation in traits). Phenotypic variance **(**σp2\sigma_p^2σp2**)**: The total observable variation in a trait, which is the sum of genetic and environmental influences. Genotypic variance **(**σg2\sigma_g^2σg2**)**: The portion of variation attributable to genetic differences among individuals. Environmental variance **(**σe2\sigma_e^2σe2**)**: The portion of variation caused by non-genetic factors such as soil, climate, or management practices. Twenty Advanced Breeding Lines were studied to identified the genetic variations by using morphological, quantitative and molecular markers. The genotypic coefficient of variation (GCV %) for days to 50% flowering was 8.81%, while phenotypic coefficient of variation (PCV %) was 9.42%. Days to maturity recorded a GCV of 3.19% and PCV of 3.94%. Plant height exhibited a GCV of 6.19% and PCV of 8.65%, whereas plant height at first fruiting node showed 9.11% and 12.98%, respectively. Stem thickness recorded 9.07% GCV and 13.50% PCV. The number of primary branches per plant exhibited 11.98% GCV and 23.44% PCV, while the number of secondary branches per plant showed 12.85% and 21.65%, respectively.

The number of pods per plant recorded 7.06% GCV and 10.73% PCV, whereas the number of effective pods per plant had 6.38% and 10.36%, respectively. The number of seeds per pod showed a GCV of 10.63% and a PCV of 11.32%. Hundred seed weight exhibited 15.57% GCV and 15.84% PCV. Biological yield per plant recorded 13.74% and 16.63%, while harvest index showed 11.16% and 13.50%, respectively. Seed yield per plant exhibited the highest variation with 19.39% GCV and 22.53% PCV. The effect of a particular genotype can vary depending on the environmental conditions also, leading to different performance in different environments. This component represents the variation in a trait that is caused by differences in the environment, such as soil conditions, climate, and management practices.

SIBPHE-2025/98

Fabrication and Evaluation of Robotic Seed Sowing Machine

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In this agricultural land of India, seed sowing is a very important aspect in the cultivation of crops. The type of seed is significant according to the type of soil, weather conditions and the kind of location. Seed germination and growth are majorly dependent on the type of seed, its diameter and planting depth of the seed. So, in consideration of these aspects, seed sowing machine plays an important role in sowing seeds with the optimum depth of plantation and type of the crop. Hence in order to sow the seeds in agriculture field for multiple crops, a capable and efficient seed sowing machine is a mandatory. The automatic seed sowing machine consists of body frame, Arduino uno microcontroller serves as the central control system for the robotic seed sowing machine, seed box, the seed metering device used in the machine is of the cup-type mechanism seed metering device, HC-05 blue tooth driver, 12V, 8 A-h rechargeable DC battery, Power bank battery, seed sowing machine is powered by a 0.5 hp permanent magnet direct current (PMDC) motor equipped with a 4-pole brushless DC (BLDC) design, gear motor, dc motor speed controller, 4-channel relay module, 5 V power bank battery which is a common type of rechargeable lithium-ion (Li-ion) or lithium polymer (Li-Po) battery for power supply to the digital circuit, DC motor speed controller is an electronic device or circuit that adjusts the speed of a DC motor by controlling the voltage or current supplied to it, soil moisture sensor, soil moisture display device and water pump. The weight of machine was 15 kg. This seed sowing machine has also a provision to sow the seeds with correct inter spacing between the lines of planting of crops. The diameters of the holes through which two types of seeds were machined accurately to make sure the right release of seeds at a specific location. The machine was tested in the field and found field capacity was 0.12 ha/h, seed

placement accuracy was 90 to 95%, the wastage of seed was 2 to 3 %, the time needed to sow 1 acre of field was approximately 2 hour, the cost per acre was 300 to 500 rupees, the labour requirement was one, the speed of operation was 1.5 to 2 km/h, the total cost of saving per hectare was 5100 rupees per hectare, the sowing efficiency was 93.2 percent, The field efficiency was 74.4 percent and the cost of machine was 19100 rupees.

Keywords: *Microcontroller, Battery, field capacity, Sowing efficiency and field efficiency.*

SIBPHE-2025/99

Role of Community Engagement in Dengue Prevention and Control in India

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Dengue, a mosquito-borne disease is a serious but preventable public health problem not only in India but also worldwide. Almost most of Indian states are now endemic for dengue infection. According to WHO, the number of dengue cases increased over 8 fold over the last two decades from 2.4 million cases in 2010, to over 5.2 million in 2019. In 2021, India reported 193245 cases with 306 deaths as per the National Vector Borne Control Programme data. Till date there is no specific treatment for dengue so vector control can be a primary method for prevention of dengue. As dengue is transmitted by the bite of female mosquito particularly by *Aedes* species in India. A large proportion of the community is not aware about the behavior and breeding places of *Aedes* species. *Aedes* species breeds in fresh water like, water tank, syntax, disposable cup, plates, tyres etc. because of this dengue control is very difficult but community engagement may be vital to prevent and control of dengue in India. This review states a paucity of reliable evidence that knowledge and attitude of the community regarding the vectors of dengue and its behaviour may play a crucial role in prevention and control of dengue in India.

Keywords: *Dengue, Aedes, breeding*

SIBPHE-2025/100

Genetic Diversity Analysis of Spine Gourd (*Momordica dioica* Roxb.) Using SSR Markers

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DNA marker-based genetic diversity analysis is a powerful approach for understanding the genetic makeup of plant genotypes and plays a significant role in crop improvement strategies. In the present study, ninety-six spine gourd (*Momordica dioica* Roxb.) genotypes were evaluated using seventy-one SSR markers to assess their genetic diversity. Statistical analysis revealed an average of 2.63 alleles per locus, with the number of alleles ranging from 2 to 5. The polymorphic information content (PIC) values varied widely, with AVRDCBG-95 showing the highest value (0.759) and SgSSR17 the lowest (0.01), giving an average PIC of 0.38. Observed heterozygosity (HObs) ranged from 0.00 (SgSSR13) to 0.98 (AVRDCBG-95), with a mean value of 0.3573, suggesting moderate heterozygosity across loci. Expected heterozygosity (HExp) was highest at AVRDCBG-95 (0.79), indicating high allelic diversity, while loci Root2 (LOC111019402) and STEM1 (LOC111022002) showed the lowest value (0.00), reflecting no expected variation. The mean HExp across loci was 0.29, highlighting a relatively narrow genetic base among the SSR loci analyzed. These findings provide insights into the genetic variability of spine gourd, offering valuable information for its genetic exploitation and supporting future breeding programs aimed at developing genetically diverse and improved genotypes.

Keywords: *Spine gourd, Genetic diversity, SSR markers, PIC, Hobs, HExp*

SIBPHE-2025/101

Effect of Fertilizer Application on Growth and seed Yield of Spinach Beet (*Beta Vulgaris var.Bengalensis* Hort.)Under Varying Levels of Moisture Regimes

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Spinach beet (*Beta vulgaris* var. *bengalensis*), an important leafy vegetable in India, is highly responsive to nutrient and moisture management. The present investigation was conducted during Rabi 2023–24 at the Horticulture Farm, S.K.N. College of Agriculture, Jobner, Rajasthan, to evaluate the combined effect of irrigation scheduling and fertilizer application on growth and seed yield. The experiment was laid out in a factorial randomized block design with ten treatment combinations involving two irrigation levels (0.75 and 1.0 IW/CPE ratios) and five fertilizer treatments, replicated thrice. Results revealed that 1.0 IW/CPE significantly improved growth attributes including plant height (145.30 cm), number of leaves per plant (41.17), leaf area (3117.32 cm²) and chlorophyll content (1.941 mg/g) compared to 0.75 IW/CPE. Among nutrient treatments, 75% RDN supplemented with Trichoderma-enriched vermicompost (8 t/ha) recorded maximum plant height (149.53 cm), leaf number (42.60), leaf area (3143.00 cm²), and chlorophyll content (1.999 mg/g), remaining statistically at par with 100% RDN + vermicompost. Seed yield per plant (9.65 g) and per hectare (12.32 q) were also highest under this treatment combination. These findings clearly establish that efficient irrigation scheduling at 1.0 IW/CPE combined with integrated nutrient management using 75% RDN + Trichoderma-enriched vermicompost not only enhances vegetative growth but also maximizes seed productivity of spinach beet under semi-arid conditions.

Keywords- *Spinach beet, vermicompost and FYM*

SIBPHE-2025/102

Exploring Yield-Related Morphological Traits to Decipher Genetic Diversity in Spine Gourd (*Momordica dioica* Roxb.) Genotypes

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Spine gourd (*Momordica dioica* Roxb.) is a nutritionally rich underutilized vegetable crop with wide potential for yield improvement through the exploration of yield-attributing traits. In the present study, seventy-one spine gourd genotypes were evaluated for ten key yield-attributing traits, including style length, ovary length and diameter, fruit length and diameter, pistil length, single fruit weight, number of fruits per plant, fruit yield per plant, and number of seeds per fruit. Significant variability was observed across genotypes, highlighting considerable genetic diversity. Among the genotypes, SG-64 exhibited the maximum style length (3.6 cm) and longest fruit length (66.48 mm), while SG-16 recorded the highest number of fruits per plant (92) and maximum yield per plant (1.75 kg). Another genotypes, SG-33 showed superior fruit weight (19.53 g), and SG-25 recorded the highest fruit diameter (37.54 mm) among the genotypes used in the study. Wide variability was observed in seed number per fruit (12–28), spine gourd genotype SG-65 and SG-12 exhibited maximum seeds per fruits while lowest were recorded in SG-7, SG-69, SG-54, SG-40, and SG-34. Findings of the study reveal substantial diversity among spine gourd genotypes, which can be strategically exploited for trait-specific selection and hybridization. The identified superior genotypes offer valuable genetic resources for future breeding programs aimed to developing high-yielding spine gourd cultivars, by enhancing its nutritional and economic significance.

Keywords: *Spine gourd, genetic diversity, yield, Trait-based selection, variability, improvement*

SIBPHE-2025/103

Biology of Fruit Flies (Diptera: Tephritidae) on Long Melon (Cucumis melo var. utilissimus)

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Fruit flies (Diptera: Tephritidae) are significant pests of long melon (Cucumis melo var. utilissimus), causing substantial economic losses in cucurbit crops. This study provides an overview of the biology of fruit flies on long melon, including their life cycle, behavior, and ecological interactions. The fruit fly species infesting long melon, such as Bactrocera cucurbitae and Zeugodacus tau, exhibit a complex life cycle involving egg, larval, pupal, and adult stages. Adult fruit flies lay eggs in the fruit, and the larvae feed on the pulp, causing damage and reducing fruit quality. Understanding the biology and ecology of fruit flies on long melon is crucial for developing effective management strategies to minimize losses and ensure sustainable production of this important cucurbit crop.

Keywords: *Fruit fly, long melon, biology, ecology, management, cucurbit crops.*

SIBPHE-2025/104

Sustainable Feed Formulations for Rainbow Trout Using Local Agro-Industrial By-Products and Medicinal Plant Extracts in Jammu and Kashmir

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The need for sustainable and economical feed formulations has grown as a result of Jammu and Kashmir's rising demand for rainbow trout (*Oncorhynchus mykiss*). In order to improve fish nutrition, growth and health while lowering production costs, this review investigates the possibilities of using locally accessible agro-industrial by-products and medicinal plant extracts. Specifically, extracts from white willow (Salix alba), garlic (Allium sativum) and chicken waste have demonstrated encouraging outcomes as feed ingredients. Rich in protein and vital amino acids, chicken waste provides a cost-effective substitute for traditional fishmeal and enhances growth performance. By altering hematological parameters and increasing antioxidant capacity, garlic, a well-known immunostimulant, improves rainbow trout's feed palatability, digestion and disease resistance. Fish health and immune function have been found to be supported by white willow's inherent anti-inflammatory and antimicrobial qualities, which lessen the need for artificial additives. By incorporating these resources, aquaculture sustainability is supported and environmental waste is reduced, all in line with the circular economy principles. In order to guarantee these ingredients safety and nutritional consistency, the review also emphasizes the necessity of standardized processing methods. The significance of additional experimental validation is emphasized as challenges like variations in nutrient composition, bioavailability, and long-term health effects are examined. All things considered, this strategy combines better fish welfare, environmental stewardship and local resource utilization to increase rainbow trout production. In Jammu and Kashmir, the use of such sustainable feed formulations can support responsible aquaculture practices, improved livelihoods and food security.

Keywords: *Rainbow trout, Sustainable feed formulations, Agro-industrial by-products, Medicinal plant extracts, Fish nutrition*

SIBPHE-2025/105

Green Synthesis of Bee-Derived Nanoparticles As A Novel Approach for Sustainable Crop Production and Protection

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Nanoparticles have emerged as promising tools in agriculture for enhancing crop productivity and disease management. However, conventional metallic nanoparticles raise concerns due to their toxicity and detrimental impacts on non-target organisms and the environment. This has intensified the need for green synthesis approaches that utilize eco-friendly, sustainable methods for nanoparticle production. Among these, bee-derived nanoparticles offer unique advantages, combining biocompatibility and multifunctionality derived from natural bee products. Moreover, coating these nanoparticles with chitosan further enhances their stability, antimicrobial activity, and plant defense elicitation, while minimizing environmental risks. Chitosan-coated bee-derived nanoparticles play a crucial role in crop improvement by promoting plant growth, enhancing disease resistance, and improving soil health. These innovative nanoformulations contribute significantly to sustainable agriculture and food security by reducing chemical pesticide dependence, mitigating environmental hazards, and improving crop yield and quality. This abstract highlights the potential and challenges of integrating green-synthesized, bee-derived, and chitosan-coated nanoparticles as advanced strategies for resilient and sustainable crop production systems.

Keywords: *Green synthesis, Bee-Derived nanoparticles, Chitosan coated NPs, Sustainable Agriculture, Crop improvement.*

SIBPHE-2025/106

Carbon Credits from Permaculture: A Pathway for Climate-Resilient and Sustainable Agri-Economies

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Climate change and environmental degradation demand agricultural models that are both ecologically restorative and economically resilient and permaculture offers such a pathway through practices like agroforestry, cover cropping, mulching, composting and closed-loop nutrient cycling. Synthesizing global evidence and carbon market data, this study develops a conceptual framework to evaluate carbon sequestration, economic viability and institutional mechanisms for monetizing carbon through voluntary markets. Empirical estimates show that agroforestry and cover cropping can sequester around 1.2 t C/ha/yr (~4.4 t CO_2/ha/yr), perennial systems such as managed grazing and agroforestry can capture 2–8 t C/ha/yr (~7–30 t CO_2/ha/yr), while biochar amendments can contribute an additional 12–25 t CO_2/ha annually, suggesting that integrated permaculture systems can realistically achieve 5–30 t CO_2/ha/yr depending on practice combinations. Economic analyses of regenerative agriculture reveal net income gains of approximately ₹5,000/ha/yr compared to conventional methods, and when coupled with carbon revenues, these systems can significantly strengthen farm incomes while incentivizing ecological practices. Crucially, advances in digital Measurement, Reporting, and Verification (MRV) technologies including blockchain, IoT, AI-driven analytics and satellite monitoring enable transparent, low-cost participation of smallholders in carbon markets. The findings highlight that permaculture not only enhances soil health, biodiversity and climate resilience but also diversifies rural livelihoods, with policy implications underscoring the need for farmer cooperatives, simplified carbon accounting systems and integration of agriculture into national carbon frameworks. Scaling permaculture-based carbon farming could thus transform rural economies, advance climate-smart agricultural goals and contribute meaningfully to national and global sustainability targets.

Keywords: *Carbon Credits, Climate Resilience, Permaculture, Rural Livelihoods, Sustainable Agriculture*

SIBPHE-2025/107

Evaluating Ocular Infrared Thermography for Non-Invasive Stress Detection in Sahiwal Heifers: Linking Thermal Signatures to Cortisol and Physiological Metrics

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Heat stress poses a serious risk to both animal welfare and productivity and emphasizes the need for accurate, non-invasive monitoring tools to help inform management decisions. This study explored the applicability of measures of ocular surface temperature (OST) obtained using infrared thermography (IRT) as a potential thermoregulatory biomarker of thermal stress in cattle. Measurements of OST were obtained at three ocular regions: inner canthus (EYETi), central ocular surface (EYETc), and outer canthus (EYETo) in indigenous Sahiwal heifers under three seasonal conditions (winter, spring, and summer). Physiological measures, including rectal temperature (RT), respiration rate, and serum cortisol levels, were simultaneously evaluated to assess heat stress. Among all the ocular regions, the EYETi region demonstrated the most consistent and responsive thermal variation across seasons, with higher mean temperatures of 34.01 °C in winter to 34.90°C in spring, and reaching a peak at 37.95 °C during summer in Sahiwal. These values corresponded with seasonal increases in RT (from 100.68 °F to 101.98°F) and serum cortisol levels, which were highest during summer, indicating heightened heat sensitivity in them. Among ocular parameters, EYETi and central eye temperature (EYETc) exhibit robust interrelationships (r = 0.93), and both correlate strongly with CORT 0.88 and 0.84, respectively. These findings show EYEi temperature serves as a reliable, non-invasive indicator for assessing cattle heat stress. reinforcing IRT's value in animal welfare assessment.

Keywords: *climate change, ocular temperature, heat stress, IRT.*

SIBPHE-2025/108

Preparation and Quality Characterization of Goat Milk-Based Herbal *Kalakand* Infused with Rhododendron Flower Juice and Jaggery

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This study focuses on developing a goat milk-based herbal *kalakand*, enriched with rhododendron flower juice (@ 0.5, 1.0, and 1.5% v/v of milk) and jaggery (@7% wt./v of milk) to enhance both its sensory appeal, physicochemical characteristics and functional benefits. The use of goat milk offers a nutritionally superior base, while rhododendron juice contributes unique floral flavours and bioactive compounds, and jaggery serves as a healthier sweetener alternative. Sensory evaluation, physicochemical characteristics, microbial quality and functional characterization were conducted to determine the product's overall acceptability and health benefits. The physicochemical characteristics of herbal *kalakand* have excelled in terms of instrumental colour and are lower in moisture and water activity compared to the control sample. The microbial quality of developed herbal *kalakand* has been found satisfactory as per FSSAI, regulations. The total phenolic content in experimental *kalakand* (treatment T_2 - rhododendron flower juice addition @ 1.0% v/v of milk) was found as 587.72 ± 1.12 in

comparison to the control *kalakand* sample, having only 369.46 ± 1.34. A significant increase in DPPH radical scavenging activity of experimental *kalakand* was 60.54 ± 0.04 in comparison to 50.12 ± 0.06 in the control sample. With increased interest in functional foods, this innovative *kalakand* formulation could have high market potential, especially as consumers seek foods with inherent health benefits. By preserving the cultural essence of *kalakand* while appealing to health-conscious consumers, this study bridges tradition with modern dietary preferences, opening avenues for future functional dairy innovations.

Keywords*: Rhododendron flower juice (RFJ), Goat milk, Herbal Kalakand, Jaggery, physico-chemical, microbial quality, sensory evaluation, Antioxidant properties*

SIBPHE-2025/109

Preparation and Quality Characterization of Litchi based *Yoghurt* Enriched with Sweet Potato by Using RSM Technique: A CCRD Approach

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About 10-14% of the total annual milk production is being used for fermented dairy products. *Yoghurt* is one of the most widely consumed fermented dairy products globally and is acidified by the addition of a starter culture containing fermenting bacteria such as *Streptococcus thermophiles* and *Lactobacillus delbrueckii ssp. bulgaricus.* The present study is focused on the development of litchi-based *yoghurt* enriched with sweet potato powder (LBYSPP) using response surface methodology (RSM). The sweet potato is used due to its nutraceutical importance, thickening, gelling and bulking properties, and litchi juice is used to improve the nutritional value and palatability of the final product. In this study, the Central Composite Rotatable Design (CCRD) of the RSM technique was employed to optimise the level of process variables of litchi juice, sweet potato powder (SPP) and sugar (at a constant rate of 6% by weight/volume of milk in each treatment

combination), based on sensory evaluation, physico-chemical and textural & rheological characteristics of LBYSPP. The sensory characteristics (flavour, body & texture, colour & appearance, and overall acceptability) were evaluated and compared with the control sample. The results reveal that milk with a 3.0% fat level, 15% litchi juice, and 6.14% SPP has the highest desirability (0.963), and is therefore selected as the optimized solution. Hence, it was confirmed that the selected addition level is most suitable for preparing a sensorially acceptable product with optimal sensory attributes.

Keywords: *Litchi juice, sweet potato powder (SPP), Litchi-based yoghurt, sensory attributes, RSM, CCRD*

SIBPHE-2025/110

Agriculture Entrepreneurship And Its Impact On Rural Developemnet And Econmic Growth In Gujarat

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Agriculture has historically been the foundation of rural economy, contributing significantly to food security, employment and income generation. In recent decades, the emergency of agriculture-based entrepreneurship, often referred to as agripreneurship, has gained increasing attention as a driver of rural development and rural economic growth. Agripreneurship play an important role in introducing innovation, technology adoption, and value addition to agriculture activities, thereby enhancing productivity and competitiveness. This study examines the impact of agricultural entrepreneurship on rural development, focusing on its contribution to employment generation, poverty reduction, and sustainable farming practices. This research highlight how agripreneurship fosters inclusive growth by creating opportunities for rural youth and women, while also strengthening local economies through improved market linkages and resources utilization. Furthermore, the findings emphasize that supportive policies, access to finances, training and infrastructure are essential for promoting agripreneurship at scale. Overall agriculture entrepreneurship emerges as a key mechanism for transforming rural communities, reducing dependency on traditional substance farming, and contributing to broader national economic growth.

Keywords: *Agriculture Entrepreneurship, Rural Development, Economic Growth, Innovation and Employment Generation.*

SIBPHE-2025/111

Supply Chain Management of Agriculture and Food Products in India

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Efficient supply chain management for agricultural and food products is essential for food security, farmer incomes, and reduction of post-harvest losses in India. This paper synthesizes structural characteristics of India's agri-food supply chains, identifies major bottlenecks (fragmented production, weak cold chains, inadequate aggregation and logistics, information asymmetry, and policy gaps), evaluates technological and institutional innovations (micro-aggregation, Farmer Producer Organizations (FPOs), cold chain infrastructure, traceability systems, and contract farming), and proposes an integrated roadmap for transformation. The proposed interventions combine investments in physical infrastructure, digital systems for traceability and price discovery, capacity building for producer groups, and targeted public–private partnerships to deliver inclusive, resilient and sustainable agri-food supply chains.

Keywords: *agricultural supply chain, cold chain, value chain, food loss, traceability, farmer producer organizations, India*

SIBPHE-2025/112

Pomegranate sustainability, growth and management in India

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Pomegranate (Punicagranatum L.) is a high-value fruit crop with growing domestic and export demand. India is a leading producer and exporter, driven by varieties such as *Bhagwa* that combine good taste with transportability. However, sustainable growth of the pomegranate sector requires integrated solutions across water-efficient irrigation, integrated pest management (IPM), improved post-harvest handling, value-added processing, and market-oriented logistics. This paper synthesizes recent evidence and policy developments, quantifies key productivity and sustainability levers (water use efficiency, yield gains, shelf-life extension), and proposes a practical roadmap for farmers, agribusinesses and policymakers to scale sustainable pomegranate production in India. Major opportunities include wider adoption of micro-irrigation with fertigation, modified atmosphere packaging (MAP) and cold chains, plus coordinated extension and finance mechanisms to reduce post-harvest loss and improve farmer incomes. (Desagri)

Keywords: *pomegranate, Bhagwa, sustainable horticulture, drip irrigation, post-harvest management, value addition, India*

SIBPHE-2025/113

Financial Management Practices and Profitability in Indian Agriculture: Challenges and Opportunities

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Agriculture remains the backbone of the Indian economy, employing nearly half of the workforce and contributing significantly to rural livelihoods. Effective financial management is critical to enhancing profitability, ensuring sustainability, and mitigating risks faced by farmers. This paper examines the financial management practices adopted by Indian farmers, including capital investment, credit utilization, risk management, and financial planning. The study identifies challenges such as inadequate financial literacy, dependence on informal credit, and limited access to institutional financing. Further, it explores opportunities offered by digital finance, government schemes, and value chain financing. The findings suggest that strengthening financial management practices is key to improving profitability and long-term agricultural sustainability in India.

Keywords: *Agriculture finance, farm profitability, financial management, credit, rural economy, India.*

SIBPHE-2025/114

महिलाओं के उत्थान हेतु सामाजिक एवं राजनीतिक दृढ़ इच्छा शक्ति

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प्रस्तुत शोध अध्ययन ‘‘महिलाओं में राजनैतिक एव सामाजिक जागरूकता’’ एक ऐसा अध्ययन है जो कि समाज शास्त्र में उद्घोषित किया गया है। आगरा शहर में किये गये अध्ययन से स्पष्ट बोध होता है कि पुरुषों की तुलना में स्रोतों की शिक्षा चिकित्सा, स्वास्थ्य एवं रोजगार के सन्दर्भ में बहुत ही कम ध्यान दिया जाता रहा है, यह भी स्पष्ट है कि भारत में स्त्रियों की अपेक्षा पुरूषों की मृत्यु दर भी कम है। भारत में विभिन्न धर्म, जाति एव सम्प्रदायों में यह देखा गया है कि स्त्रियांयों की आबादी कम पाई जाती रही है। जिसके लिए हमारी सदियों पुरानी संकुचित सम्बन्धित को जिम्मदेार व ठहराया जा सकता है। वर्तमान में स्त्रियों की सामाजिक एवं राजनीतिक स्त्रियों में सुधार हेतु शिक्षा, स्वास्थ्य एवं रोजगार के अवसर उपलब्ध कराने होगें एवं स्त्रियों में शोषण एव दमन के विरुद्ध संघठित होकर संघर्ष करना होगा।

सन्दर्भित शब्द कोष - शोषण, दमन, सामाजिक, शिक्षा।

SIBPHE-2025/115

Modern Agriculture and Its Effects on the Environment

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Modern agriculture (intensive/high-input agriculture) has boosted global food production but has produced significant environmental externalities: greenhouse gas emissions, land-use change and deforestation, water over-use and nutrient pollution, soil degradation, biodiversity loss (including pollinators), and chemical contamination from pesticides. This paper reviews recent literature on these impacts, quantifies major pathways where possible, and discusses mitigation strategies (precision agriculture, agro ecology, regenerative practices, policy measures).The goal is to synthesize current evidence to inform researchers, policymakers, and practitioners about trade-offs and scalable solutions.

SIBPHE-2025/116

Use of Drones and Satellite Imaging in Crop Monitoring and Management

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The agriculture sector is undergoing a significant transformation with the adoption of advanced technologies aimed at improving productivity, efficiency, and sustainability. Among the most impactful innovations are drones (Unmanned Aerial Vehicles - UAVs) and satellite imaging, which have become key tools in the domain of precision agriculture. These technologies enable farmers and agronomists to collect real-time, high-resolution data for monitoring crop health, soil conditions, irrigation needs, and pest infestations, leading to data-driven decision-making and optimized resource utilization.

Drones provide high spatial and temporal resolution imagery, making them suitable for field-level monitoring. They can be equipped with RGB, multispectral, hyperspectral, and thermal sensors to detect subtle variations in plant health that are invisible to the naked eye. Their ability to fly on demand allows for timely data collection, making them especially useful during critical growth stages or after extreme weather events.

Satellite imaging, on the other hand, offers a broader perspective, covering large geographic areas with consistent time-series data. With advancements in satellite technology, platforms like Sentinel-2 and Landsat 8 now provide free, high-quality imagery that can be processed to generate vegetation indices such as NDVI (Normalized Difference Vegetation Index). These indices are widely used for assessing crop vigor, forecasting yields, and planning harvests.

Keywords*—Agriculture, Precision Farming, Drone Technology, Satellite Imaging, Crop Monitoring, Remote Sensing, Smart Farming*

SIBPHE-2025/117

Millets - Moringa Value addition : A Sustainable Approach for Food & Nutritional, Environmental and Economical Insecurity Issues in India

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World is facing with agrarian, environmental, nutritional and economical challenges. Our agricultural lands are being exploited by improper and unhealthy irrigation facilities. Hence it is the need of hour to focus on the eco-friendly agricultural approaches to overcome all these ongoing challenges sustainably.

Nutritional security is one of the key factor to improve the health status of the worlds population as mankind is primarily dependent on plant-based diets. So plants are the major sources of nutrients essential for normal growth and development. India has one of the worlds highest demographics of children suffering from various types of malnutrition, which is double that in Sub-Saharan Africa. In particular, the rate of undernutrition from lack of micronutrients, especially iron deficiency anaemia, is high in India. Good nutrition, particularly during infancy and childhood can promote adequate physical and mental development.

Millets as highly climate change complaint crops and gluten free over other grains in terms of marginal growing conditions and high nutritional value.These nutricereals abode vitamins, minerals, essential fatty acids, phytochemicals and antioxidants can help to eradicate nutritional deficiency disease hence included in the government flagship 'Poshan Abhiyaan' to fight malnutrition and hidden hunger. Likewise Moringa oleifera (Drumstick) is also a fast growing drought resistant leguminous underutilized tropical crop, rich in protein and other nutraceutical content and are being recommended by nutritionist to solve the problem of malnutrition worldwide. Moringa can withstand both severe drought and mild frost conditions and hence widely cultivated across the world. The leaves are rich in minerals, vitamins and other essential phytochemicals. Extract from the leaves and beans are used to treat malnutrition, augment breast milk in lactating mothers. It is used as

potential antioxidant, anticancer, anti-inflammatory, anti diabetic and antimicrobial agent.

Value addition is a process by which the coarse grains are made more palatable and acceptable to the consumers. Underutilized plants and cereals can be utilized for the development of the food products enriched with the nutrients which facilitates the availability of nutrition.A variety of value added products can be prepared from the coarse grains of millets and moringa such as deep fried snack products (bajra, ragi, jowar and small millets) Chakli, Thengolal, Papad, Sandige, Flaked grains, Refined miller flour, Puffed grains, Ragi-Wheat Composite laddoo enriched with Moringa Olifera Leaves, halwa, khichdi, dalia, chips etc.

Millet - Moringa approach can keep dry lands more productive and enrich the small scale farmer's lives by increasing their incomes. The health of soil and environment will be improved by implanting such high nutritive and stress bearing crops and plants. They will improve the microflora of the soil, food chain and nutrient cycle of the ecosystem. Less or zero use of chemicals , sustainable irrigating ,harvesting and processing techniques will contribute to more agriculture productivity and environmental security with less pollution.The scientific efforts of this research provides insights on the cultivation, plantation and value addition of both these miraculous crops and trees to ensure food , nutritional, economical and environmental security sustainably across the globe.

SIBPHE-2025/118

Climate-Smart Agriculture: Driving Public Health and Nutrition Security in a Changing Climate

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Climate-Smart Agriculture (CSA) has emerged as a transformative approach to address the interconnected challenges of food security, environmental sustainability, and public health. Climate-Smart Agriculture (CSA), grounded in the principles of sustainable intensification, incorporates practices that enhance agricultural productivity, bolster resilience to climate variability, and reduce greenhouse gas emissions. Its impact extends beyond agricultural outputs, contributing to improved nutrition security, supporting disease prevention, and fostering overall community well-being. Through crop diversification, sustainable resource management, and biofortification, Climate-Smart Agriculture (CSA) enhances the availability of nutrient-dense foods vital for addressing malnutrition and micronutrient deficiencies. At the biochemical level, these practices affect nutrient assimilation, secondary metabolite synthesis, and antioxidant profiles, thereby enhancing both the nutritional quality and functional properties of crops. In parallel, improved soil and water management practices strengthen food safety by reducing contamination risks, thereby contributing to more resilient and health-oriented food systems. CSA also plays a pivotal role in reducing exposure to vector-borne diseases by limiting ecosystem disruptions caused by unsustainable agricultural practices. Additionally, climate-resilient farming strengthens livelihoods, reducing vulnerability to economic shocks that often compromise dietary diversity and health outcomes.

The promotion of agro-ecological techniques under CSA not only mitigates climate change but also strengthens local food systems to withstand extreme weather events, thereby supporting stable access to safe and

nutritious foods. The synergy between CSA and public health highlights the need for interdisciplinary policies that link agricultural development with health promotion. Expanding CSA has the potential to enhance climate resilience and sustainable food production, while also promoting healthier populations. This is particularly significant in low- and middle-income countries, where the impacts of climate change on health and food systems are most pronounced.

Keywords: *Climate Resilience, Climate-Smart Agriculture, Nutrition Security, Public Health, Sustainable Food Systems*

SIBPHE-2025/119

Effect of Zinc Nanoparticles Synthesized From Buniumpersicum On Antifungal Activity Against Phaeoisariopsis Personatum Causing Agent of Late Leaf Spot of Arachis Hypogea.

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Integration of nanoscience in medicine leads to the development of biomedical products that helps the society in a faster and safer manner. In the present studies zinc nanoparticles were synthesized by green route using aqueous extracts of Bunium persicum. Characterization was done through UV, SEM, TEM, FT-IR and XRD. The synthesized nanoparticles were spherical in shape with an average size of 10 nm. Various bioactive compounds present in aqueous extract of this plant were responsible for bio reduction of nanoparticles. Further these nanoparticles were tested for antifungal activity against Phaeoisariopsis personatum causing agent of Late leaf spot of Arachis hypogea. Zinc nanoparticles at various treatment doses showed significant activity against this plant pathogen.Result showed the biosynthesis of zinc nanoparticles using aqueous extract of Bunium persicum is a clean, inexpensive and safe method that is free from toxic substance and consequently does not have any side effects.

Keywords- *Bunium Persicum**,** Nanoscience**,** Green synthesis**,** UV spectroscopy**,** SEM **,**TEM FT-IR , XRD , Bioreduction**,** Antifungal activity**,** Arachis hypogea (Groundnut).*

SIBPHE-2025/120

Sustainable Trade Practices in Agricultural Product Management: Balancing Profitability and Ecology

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Agricultural trade plays a pivotal role in ensuring global food security, sustaining rural livelihoods, and driving economic development. However, the persistent emphasis on profitability in agricultural product management has often come at the expense of ecological integrity, resulting in deforestation, biodiversity loss, soil degradation, and climate change impacts. This paper explores how sustainable trade practices can bridge the gap between economic growth and environmental stewardship. It highlights the importance of eco-friendly production methods, transparent supply chains, certification systems, and market diversification as key strategies for fostering sustainable agricultural trade. The study draws on case studies from Latin America, India, and the European Union to illustrate practical models of success, such as fair-trade coffee, organic rice cultivation, and policy-driven sustainability frameworks. While opportunities exist in integrating technology, promoting farmer cooperatives, and leveraging global sustainability initiatives, challenges such as certification costs, market inequities, weak policy enforcement, and limited consumer awareness continue to hinder progress. Nevertheless, the adoption of green logistics, fair-trade policies, renewable energy use, and digital innovations like blockchain can enhance transparency and profitability while reducing ecological footprints. The paper concludes that aligning profitability with ecological responsibility is both possible and necessary for the future of agricultural trade. Sustainable practices not only secure long-term productivity but also strengthen resilience against climate risks and market volatility. Thus, a balance between profitability and ecology is not a compromise but an essential pathway toward equitable and sustainable global agricultural trade.

Keywords : *Sustainability, Agricultural Trade, Product Management, Profitability, Ecology, Fair Trade, Supply Chain, Organic Farming, Green Logistics, Farmer Empowerment, Policy Frameworks, Blockchain in Agriculture*

SIBPHE-2025/121

योगिक जीवनशैली और पोषण में सात्त्विक आहार एवं जैविक कृषि की भूमिका

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भारत आज दोहरी स्वास्थ्य चुनौती का सामना कर रहा है। एक ओर कुपोषण तथा दूसरी ओर जीवनशैली सम्बन्धी रोगों की बढ़ती समस्या। राष्ट्रीय परिवार स्वास्थ्य सर्वेक्षण (NFHS-5, 2021) के अनुसार **भारतीय महिलाओं में 35% से अधिक और पुरुषों में लगभग 32% अधिक वजन या मोटापे से ग्रस्त हैं**, साथ ही सूक्ष्म पोषक तत्वों की कमी भी व्यापक है। अस्वास्थ्यकर आहार एवं रासायनिक खाद्य पदार्थ इस समस्या के मुख्य कारण हैं।

योग दर्शन में *आहार* को स्वास्थ्य का आधार माना गया है। *सात्त्विक आहार* ताज़ा, पौध-आधारित एवं प्राकृतिक खाद्य पाचन को संतुलित करता है, मानसिक स्पष्टता प्रदान करता है और रोग-निवारण में सहायक होता है। भारतीय शोध से यह स्पष्ट है कि सात्त्विक आहार तनाव को कम करता है, प्रतिरक्षा शक्ति को बढ़ाता है और चयापचय सम्बन्धी विकारों को घटाता है।

भारत में जैविक कृषि निरंतर बढ़ रही है। **कृषि एवं प्रसंस्कृत खाद्य उत्पाद निर्यात विकास प्राधिकरण (APEDA, 2023)** के अनुसार **4.43 मिलियन हेक्टेयर भूमि जैविक प्रमाणन के अंतर्गत है**, और भारत विश्व में सर्वाधिक जैविक कृषकों वाला देश है। भारतीय कृषि अनुसंधान परिषद (ICAR) के अध्ययन बताते हैं कि जैविक फसलों में **अधिक एंटीऑक्सीडेंट** तथा **कम कीटनाशक अवशेष** पाए जाते हैं।

यह शोध सात्त्विक आहार और जैविक कृषि के समन्वय को सार्वजनिक स्वास्थ्य सुदृढ़ीकरण की दिशा में एक प्रभावी मार्ग मानता है। योगिक जीवनशैली के साथ जैविक पोषण को अपनाकर भारत सतत कृषि, बेहतर स्वास्थ्य और प्रकृति-संगत समाज की ओर अग्रसर हो सकता है।

मुख्य शब्दः *योग, सात्त्विक आहार, जैविक कृषि, पोषण, सार्वजनिक स्वास्थ्य*

SIBPHE-2025/122

Assessing the Quality of Drinking Water in Palanpur Division

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In this study, triplicate samples taken from boreholes in nine chosen villages in Gujarat's Palanpur Division are analyzed to evaluate the groundwater quality in those villages. pH, fluoride, total dissolved solids (TDS), dissolved oxygen (DO) were among the significant physicochemical and biological parameters that were assessed. There was spatial variability in the results, as several samples exceeded the WHO, TDS, and fluoride limits in addition to the BIS (10500:2012) standards. Villages like Madana and Gadh had extremely hard water with TDS levels above 1000 mg/L. Several locations had fluoride concentrations close to 1 mg/L, which could be harmful to health. The results emphasize that in order to guarantee drinkable groundwater and long-term water security in the area, community-level interventions, defluoridation units, water softening, and regular monitoring are required.

SIBPHE-2025/123

Chemical and Microbiological Perspectives: An Examination of Banaskantha Water

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This study evaluates the physicochemical and microbiological quality of drinking water from seven talukas in Gujarat's Banaskantha district, a semi-arid region reliant on groundwater. We looked at important factors like pH, fluoride, TDS and coliform bacteria. The results also showed that Bhabhar had higher TDS (1580 mg/L). Even though coliform counts (22–50 MPN/100 mL) were higher than BIS standards in all samples, which suggests microbial contamination, fluoride levels were still safe. The results show that there are problems with public health and that the area needs more focused monitoring and management of water quality.

SIBPHE-2025/124

Education for Change: Environmental Psychology as a Pathway to Community Based Sustainable Development

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Background: Sustainable development in India faces pressing challenges, including air pollution affecting over 62% of urban populations, groundwater depletion in more than 70% of districts, and rising waste generation projected to reach 165 million tonnes annually by 2030 (MoEFCC, 2022; NITI Aayog, 2021). Environmental psychology provides critical insights into how education can influence individual and collective behavior to address these issues.
Method: The paper employs a conceptual and case-based analysis, integrating evidence from Indian community led interventions such as the Hiware Bazar watershed management project in Maharashtra, organic farming initiatives in Sikkim (India's first fully organic state, 2016), and Delhi-based behavioral campaigns on air pollution awareness. These cases are analyzed through the lens of environmental psychology, focusing on attitude change, risk perception, and collective responsibility.
Results: Findings indicate that when environmental education incorporates psychological strategies such as role modeling, social norms, and participatory learning communities demonstrate measurable outcomes. For example, Hiware Bazar improved groundwater levels by 60% within a decade, while Sikkim's organic policy increased farmer income by 20–30% through eco-tourism and premium markets.
Conclusion: Embedding environmental psychology into educational frameworks bridges the gap between awareness and sustainable action. It empowers communities with cognitive tools and behavioral strategies, fosters eco-conscious citizenship, and enhances resilience against ecological challenges. Such an approach is essential for India's vision of achieving Sustainable Development Goals (SDGs) by 2030.

Keywords: *Environmental Psychology, Education for Sustainability, Community Engagement, Behavioral Change, Sustainable Development*

SIBPHE-2025/125

Integrated Farming Systems for Sustainable Agriculture and Livelihood Security in Rajasthan

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At present, the farmers concentrate mainly on crop production which is subjected to a high degree of uncertainty in income and employment to the farmers. Integration of various agricultural enterprises viz., cropping, animal husbandry, fishery, forestry, etc. have great potentialities in the agricultural economy. The integrated farming system approach introduces a change in the farming techniques for maximum production in the cropping pattern and takes care of optimal utilization of resources. The basic principles of IFS are namely suitability, sustainability, productivity, and profitability for achieving steady and stable income of farmers incomes, agro-ecological equilibrium, avoiding the build-up of biological stress, and avoiding the build-up of biological stress. There are different types of IFS modules recommended by different agricultural institutions and state agricultural universities. About Rajasthan, different types of IFS models are recommended for different regions according to their climatic conditions. These IFS systems are developed for dryland regions, rainfed farming, semi-arid plains, and limited irrigated situations. For dryland area, crop + tree + grass + livestock IFS system suggested. However, Agri-horti-livestock IFS for rainfed area and Livestock + crop IFS recommended for semi-arid plains as a sustainable production system. For limited irrigated conditions, fruits + fields crops + medicinal plants gives maximum profits to farmers. These IFS offer scope to provide sustainability in production, profitability and generate employment for farmers besides household-level food and nutritional security and many of them contribute towards ecosystem services.

Keywords: *Integrated Farming System (IFS), sustainability, profitability, livelihood security, agro-ecological equilibrium, resource utilization, and Rajasthan agriculture.*

SIBPHE-2025/126

A Comparative Study of Population and Distribution of Indian Peafowl (*Pavo cristatus L.*) during Covid-19 in specific sites in Bharatpur Rajasthan

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The COVID-19 pandemic and the subsequent lockdown imposed by the government in 2020-2021 also had an impact on the peafowl ecology and behavior. The aim of this study was to compare the population and distribution of Indian peafowl in specific sites in Bharatpur, Rajasthan, These sites are Village Kandholi in Tehsil Rupbas, Village Saman-Penghore in Tehsil Kumher, and Anirudh Nagar colony in Bharatpur city From September 2020 to August 2023. The results showed that the peafowl population increased significantly during the lockdown period in all three sites. The main reasons for the population increase and distribution expansion were reduced human disturbance, increased food availability, decreased poaching, and improved habitat quality. But after the Lockdown (in 2021-22,2022-23) there was a progressive decrease in the population in all three sites.

Increased species diversity especially in urban areas likely derives from a reduction in noise and air pollution associated with the lockdown, implying that urban planners should consider conservation co-benefits.

Keywords: *COVID-19, Distribution, Pavo cristatus, population, Bharatpur city*

SIBPHE-2025/127

Socio-economic Empowerment of the underprivileged through Village Industries

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The development of village has been directly lies in the discourse of the development of village or cottage industries in India since time immemorial. The village or cottage industries have been a big importance of socio-economic empowerment of the underprivileged at grassroots level. **V**illage industries play a pivotal role in fostering socio-economic empowerment, particularly in rural and semi-urban areas where access to formal employment and industrial infrastructure is limited. Rooted in traditional knowledge, locally available resources, and community-based practices, these industries offer sustainable livelihood options while preserving cultural heritage. This paper examines the transformative impact of village industries on individual and community development by analyzing their contribution to income generation, employment creation, skill enhancement, and social inclusion.

By supporting cottage and small-scale industries such as handicrafts, handloom, food processing, pottery, and rural manufacturing, communities can move toward economic self-reliance. The development of village industries not only reduces dependency on agriculture but also minimizes rural-to-urban migration by creating localized employment opportunities. Moreover, the involvement of women, marginalized groups, and artisans in these industries enhances social equity and financial independence. Government initiatives such as the Khadi and Village Industries Commission (KVIC), microfinance schemes, and cooperative models have significantly contributed to the growth of rural enterprises. However, challenges such as limited access to modern technology, market linkages, and capital remain. Addressing these barriers through skill development programs, digital empowerment, and value chain integration can amplify the impact of village industries.

In conclusion, village industries are vital instruments for grassroots-level economic empowerment and social development. With appropriate policy support, capacity building, and technological integration, these industries can evolve into robust engines of inclusive growth and rural transformation of society at a large.

Keywords: *Village Industries/Cottage Industries, Empowerment, Underprivileged, Rural Development, Employment Generation, Community based practices, Sustainable development.*

SIBPHE-2025/128

Effect of climatic variability on Tea production in H.P.

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Tea (Camellia sinensis) cultivation in Himachal Pradesh is highly vulnerable to climatic variability, which poses significant challenges to both yield and quality. This study examines the effects of changing temperature patterns, erratic rainfall, humidity fluctuations, and extreme climatic events on tea production. Analysis of historical climate and production data indicates that rising temperatures and irregular monsoon patterns have altered the phenology of tea plants, reduced leaf yield, and negatively affected biochemical constituents such as catechins and polyphenols. Prolonged dry spells and sudden rainfall events also exacerbate pest and disease incidence, further impacting productivity. The findings emphasize the importance of adopting climate-resilient strategies, including site-specific irrigation, mulching, shade management, and the development of tolerant tea cultivars, to mitigate adverse effects. This research provides critical insights for stakeholders, policymakers, and tea growers aiming to sustain and enhance tea production under changing climatic conditions.

Keywords: *Tea production, Himachal Pradesh, climatic variability, temperature, rainfall, phenology, yield, climate-resilient strategies*

SIBPHE-2025/129

Impact of Climate-Smart Agriculture and Nutrition on Athletes 'Physical Performance

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Shifts driven by climate change are transforming global food systems, influencing not only the supply but also the nutrient composition of foods vital to supporting athletic performance. Climate-smart agriculture (CSA)—an approach that integrates productivity, adaptation, and mitigation—offers a pathway to protect and enhance the nutrient density, safety, and continuity of athlete food supplies while reducing environmental footprints. This paper synthesizes evidence linking CSA practices (e.g., soil-health management, diversified cropping, sustainable livestock systems, and resilient supply chains) to nutrition outcomes with direct and indirect consequences for athletes 'physical performance. We review (1) mechanisms by which climate stressors and elevated atmospheric CO_2 reduce crop micronutrients (iron, zinc, protein), (2) how production systems influence fatty-acid profiles in animal-source foods relevant to recovery and inflammation, (3) the role of sustainable dietary patterns and food-system resilience in preventing low energy availability and performance impairment, and (4) emerging intersections between gut health, probiotics/fermented foods, and endurance. We integrate these findings with contemporary sports-nutrition guidance to build a practical framework for sports programs and food-service operations seeking to align performance goals with climate and nutrition security. Incorporating community-supported agriculture (CSA) into the nutritional strategies of athletes, alongside individualized fueling and recovery protocols, offers a dual advantage: enhanced consistency in performance and greater alignment with principles of environmental sustainability. This approach not only prioritizes fresh, locally sourced foods but also fosters stronger connections between athletes and food systems. However, to fully validate its effectiveness, future research must explore long-term interventions that examine how CSA-based nutrition influences

physiological markers, recovery dynamics, and overall athletic output. At the same time, practical barriers—such as financial feasibility, seasonal availability of produce, and maintaining adherence over time—must be systematically addressed to ensure this model is both realistic and beneficial for diverse athletic populations.

Keywords: *climate-smart agriculture, sports nutrition, nutrient density, performance, resilience, sustainability, elevated* CO_2*, soil health, omega-3 fatty acids, probiotics*

SIBPHE-2025/130

Innovations in Health Care

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Innovations are the source of all human development and improvement of quality of life. At the same time, they challenge existing standards, solutions and societal patterns. In health care in particular, innovations enable us to treat previously incurable diseases or to make better use of scarce resources. However, they also make existing health care technologies obsolete, force specialists to learn completely new methods and require high investments. Consequently, in this paper we develop a conceptual framework model for the development, adoption and diffusion of innovations in health care. We analyse barriers and promoters of innovations, in particular meta-stability, costs, innovative ability and leadership and apply the framework to three innovations: personalized medicine, digital health, and implants. We conclude that strategic innovation management in healthcare is a prerequisite of the rapid development and adoption of innovations and the improvement of quality of life of the (aging) population. novation is not the same as invention. While the invention describes the first emergence of a new idea or product, an innovation can be seen as the initial commercial implementation of a new idea as well as the economic optimization of knowledge utilization. Accordingly, a narrower innovation term relates to successful market introduction. A distinction can be made between the invention as the generation of ideas and the first technical realization (e.g., a prototype)and the innovation as the more comprehensive process starting with the generation of ideas and ending with the successful acceptance by potential users (adoption), but both concepts are closely linked.

keywords- *Health, Innovation, Invention*

SIBPHE-2025/131

Pollutants in The Environment: Present and Future Challenges To Life and Its Remedies

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Environment pollution is a wide-reaching problem and it is likely to influence the health of human populations is great. Developmental activities such as construction, transportation and manufacturing not only deplete the natural resources but also produce large amount of wastes that's leads to pollution of air,water,soil and oceans;gobel warming and acid rains. Untreated or improperly treated waste is a major cause of pollution of rivers and environmental degradation cause ill health and loss of crop property. This paper provides major causes of pollution and there effects an. The insight view about the affects of environment pollution in the perspective of air pollution, water and land/ soil waste pollution on human by diseases and problems, animals and trees/ plants. Study finds that these kinds of pollutions are not only seriously affecting the human by diseases and problems but also the animals and trees/ plants. According to author, still time left in the hands of global institutions, governments and local bodies to use the advance resources to balance the environment for living and initiates the breathed intellectuals to live friendly with environment. As effective reply to contamination is largely base on human appraisal of the problem from every age group and contamination control program evolves as a nationwide fixed cost-sharing effort relying upon voluntary participation.

Keywords: *Pollutants, Environment, Air Pollution; Water Pollution; Soil Pollution; Land Pollution, Threats, Remedies.*

SIBPHE-2025/132

Studies on variability and character association in *Kharif* Onion (*Allium cepa* L.) in Bundelkhand region of UP

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Onion (*Allium cepa* L.), a member of the family Amaryllidaceae, is an important vegetable crop grown worldwide and valued for both its nutritional and medicinal properties. In the present study, twenty-one *kharif* onion genotypes were evaluated at the Vegetable Science Research Field, Rani Lakshmi Bai Central Agricultural University, Jhansi, to assess genetic variability, association among traits, and multivariate patterns using principal component analysis (PCA) and cluster analysis. Genotypes were characterized for growth, yield, and biochemical attributes. Analysis of variance revealed significant variation among most traits, confirming the presence of substantial genetic diversity. High genotypic and phenotypic coefficients of variation were recorded for anthocyanin content, double percentage, and total phenol content, while moderate variability was observed for yield-related traits. High heritability estimates coupled with considerable genetic advance indicated the effectiveness of selection for bulb diameter, average bulb weight, and yield. Correlation studies revealed that gross yield was positively associated with plant height, number of leaves, bulb diameter, and bulb weight, whereas neck thickness, days to maturity, and thrips incidence showed negative associations. PCA partitioned the multidimensional variation, with the first three components explaining over 86% of the diversity for agromorphological traits, while the first two accounted for more than 66% of the biochemical variation. Cluster analysis grouped the genotypes into four divergent clusters, suggesting scope for hybridization between distant groups. These results provide useful insights for onion improvement under *kharif* conditions.

Keywords: *kharif onion, genetic variability, correlation.*

SIBPHE-2025/133

Next-Gen Farming: Artificial Intelligence and Machine Learning Applications in Agriculture

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Agriculture today is confronted with mounting challenges brought on by climate change, limited resources, and the growing demand for agro-product worldwide. Traditional farming practices, while valuable, often fall short of meeting modern needs for efficiency, sustainability, and resilience. In response, advances in artificial intelligence (AI), machine learning (ML), and deep learning (DL) are beginning to transform the agricultural landscape by introducing automation, predictive insights, and precision farming across all stages of production. Despite these advancements, the combined potential of ML and DL in agriculture remains underexplored. In areas such as yield prediction and pest management, results have been mixed, highlighting that the success of these models depends heavily on the context in which they are applied. This underlines the importance of interdisciplinary collaboration among agronomists, data scientists, and policymakers to design solutions that are both effective and adaptable.

This study provides a comprehensive overview of AI applications in agriculture, spanning land monitoring, soil management, nutrient optimization, irrigation, weed and pest detection, yield forecasting, and post-harvest management. Case studies demonstrate the high accuracy of models such as convolutional neural networks (CNNs), recurrent neural networks (RNNs), random forests (RF), and support vector machines (SVM), while also identifying persistent challenges, including limited data availability, high computational requirements, and restricted access for smallholder farmers. The paper concludes by outlining future directions, emphasizing the need for lightweight, generalizable models, standardized datasets, federated learning approaches, and open-source platforms. By combining innovation with inclusivity, AI can play a crucial role in building agricultural systems that are sustainable, efficient, and equitable on a global scale.

SIBPHE-2025/134

Innovations in Biotechnology and Therapeutic Applications of Gloriosa superba for Enhanced Public Health Outcomes

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Recent research has established that Gloriosa superba contains highly medicinal compounds mainly because of its alkaloids like colchicine and gloriosine, in addition to flavonoids, glycosides, and other bioactive molecules. In the traditional setting, it has been used to treat arthritis, gout, skin ailments, snake venom bites, and even cancer, and the tubers and rhizomes of the plant contain most of these pharmacologically active compounds. Ethanolic extracts were effective against psoriasis through inhibition of the JAK/STAT pathway and keratin 17 protein downregulation, with potential for antipsoriatic uses. The plant is also particularly effective in bringing about anti-inflammatory action, with colchicine proving more effective than conventional drugs in model systems. In addition, Gloriosa superba also displays high antioxidant and anticancer activities, and methanolic extracts are cytotoxic to human liver cancer cell lines. Antimicrobial and anthelmintic activities have been reported in various extracts, validating its extensive traditional application against infections. Notwithstanding these advantages, there are safety issues owing to the plant's toxicity, especially from overdose of colchicine, with a need to exercise caution in dosing and clinical monitoring. In conclusion, Gloriosa superba is a valuable crop for bioactive compounds with manifold medicinal uses from anti-inflammatory, anticancer, to antimicrobial uses but with a need for judicious use.

Keywords: *Gloriosa superba, Medicinal properties, Colchicine, Anti-inflammatory, Anticancer, Biotechnology*

SIBPHE-2025/135

Prespevtives of Bioinformatics in Biotechnology and Crop Improvement

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Bioinformatics is the interdisciplinary science of collecting, storing, analyzing, and interpreting large amounts of complex biological data, using computational tools and methods to understand biological systems and inform advancements in medicine and other life sciences. It involves collaboration between biologists, computer scientists, mathematicians, and statisticians to develop and apply software tools for data analysis, such as genomic sequences, and to model biological processes. The rapid advancement of high-throughput technologies in genomics, proteomics, biomedical imaging, and other life sciences has led to an unprecedented expansion of biological data. Bioinformatics has emerged as a crucial discipline for managing, analyzing, and integrating these vast datasets, enabling the discovery of meaningful patterns and accelerating research in medicine, agriculture, and biotechnology. Data mining and machine learning methods are increasingly employed to extract reliable insights from both structured and unstructured data, while computational infrastructures such as high-performance clusters, GPU-based systems, Xeon Phi coprocessors, and cloud computing platforms provide the scalability required for processing complex biological information. Furthermore, semantic web technologies, ontologies, and linked data approaches facilitate interoperability across heterogeneous datasets, enhancing the accuracy and context of bioinformatics analyses. These advances support diverse applications, including early disease detection, drug discovery, gene therapy, protein structure analysis, and crop improvement through genome engineering. To maximize the potential of such data in areas like clinical diagnosis and the evaluation of drug effects on experimental outcomes, it is critical to develop automated methods capable of handling complex, large-scale datasets.

Keywords: *Bioinformatics, Biotechnology, Crop Improvement, Data mining, Biological systems , Genomic sequences.*

SIBPHE-2025/136

Evaluation of Pearl millet Varieties in Hyper Arid Partially Irrigated Western Plain

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A field evaluation was conducted in *kharif* season of 2023 at ARS, Swami Keshwanand Rajasthan Agricultural University, Bikaner to assess the performance of eight pearl millet [*Pennisetum glaucum* (L.) R. Br.] varieties with respect to phenology, yield attributes and productivity. The experiment was laid out in randomized block design with three replications using eight pearl millet varieties *viz.*, BHB-1602, RHB-223, HHB 299, MPMH 21, HHB-67 Imp., PC 701, Dhanshakti and 85M36. Significant variations were observed among the varieties for days to 50% flowering, maturity, effective tillers, test weight and yield traits. Days to 50% flowering ranged from 40.0 days in HHB-67 Improved to 53.7 days in PC 701, while maturity duration varied between 75.7 days in RHB-223 and 83.0 days in PC 701. Maximum number of effective tillers (13.16/m row length) was recorded in BHB-1602, followed by MPMH 21 (12.04). Grain number per ear was highest in HHB 299 (2434) and PC 701 (2423), whereas the minimum was observed in HHB-67 Improved (1385). Test weight ranged from 6.41 g in BHB-1602 to 10.43 g in Dhanshakti. Grain yield varied from 1648 kg/ha (HHB-67 Improved) to 2459 kg/ha (HHB 299), while the highest stover yield (10006 kg/ha) was produced by 85M36. Consequently, the maximum biological yield (12006 kg/ha) was also recorded in 85M36, followed closely by PC 701 (11793 kg/ha). The results indicate that HHB 299 excelled in grain yield, whereas 85M36 and PC 701 were superior for total biological productivity, highlighting their suitability for profitable cultivation under the prevailing conditions.

Keywords: *Pearl millet, varieties, productivity, hyper arid,*

SIBPHE-2025/137

Comparative evaluation of meloxicam, carprofen and tolfenamic acid for postoperative pain management in canine orthopaedic patients

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The present study was conducted on 18 clinical cases of dogs for anaesthetic and analgesic management of long bone fractures divided randomly into 3 groups based on the analgesic regimen given for surgical intervention. The animals of group A received meloxicam @ 0.2mg/kg OD IM, group B animals received carprofen @ 4 mg/kg SC OD while tolfenamic acid @ 4mg/kg OD IM was used in group C. Any of these three drugs were injected 30 min prior to administration of preanaesthetics followed by once daily regimen for 5 days. A non-significant ($p>0.05$) increase in HR was observed after 5 min of sedation which increased significantly ($p<0.05$) higher till 60 min. A non-significant ($p>0.05$) decrease in RR and RT was observed after sedation followed by significantly ($p<0.05$) decreased values till completion of surgery. MAP values were non-significantly ($p>0.05$) increased after sedation which further increased significantly ($p<0.05$) after induction and returning to baseline values at end. Mean total pain score values in animals of group A and B, gradually decreased significantly ($p<0.05$) from day zero through day 1, day 3 and day 5. However, in animals of group C, the values of mean UMPS were significantly decreased ($p<0.05$) from day of surgery till third postoperative day. However, there was no significant ($p>0.05$) difference in the values of UMPS between day third and fifth after surgery in animals of group C. However, the pain scores were non-significantly ($p>0.05$) lower in animals of group B in comparison to other groups after surgery throughout the observation period. Hence it was concluded that carprofen was the most effective of the three analgesics used in present study for analgesic management of canine orthopaedic patients.

SIBPHE-2025/138

Evaluation of Bone Marrow Nucleated Cells and TGF-β_1 for Segmental Fracture Gap Repair in Rabbits

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The osteogenic potential of autologous bone marrow nucleated cells (BMNCs), both in the presence and absence of transforming growth factor beta-1 (TGF-β_1), was systematically evaluated for their efficacy in promoting the healing of radial segmental defects in New Zealand white rabbits. BMNCs were isolated from bone marrow aspirates using a volume reduction centrifuge technique and subsequently used to treat segmental defects in the radius bone. The study was organized into three experimental groups: Group A (control) received hydroxyapatite grafting alone; Group B was treated with BMNCs alone; and Group C received a combination of BMNCs along with TGF-β_1 following hydroxyapatite grafting in the defect site.The progress of bone repair was comprehensively assessed through a range of methods, including clinical evaluation, gross morphological observations, radiographic imaging, angiographic studies, histomorphological and histochemical analysis, as well as scanning electron microscopy. These assessments were conducted at 30, 60, and 90 days postoperatively. Gross observations indicated that defect filling was markedly superior in Groups C and B when compared to the control Group A. Radiographic evaluations demonstrated enhanced new bone formation and remodeling in the animals of Groups C and B, reflecting more advanced stages of healing relative to Group A. Angiographic studies revealed normal vascular patterns at all stages of healing; however, at 30 days post-surgery, animals in Group C exhibited a pronounced increase in vascular supply, which subsequently normalized over time. Histological examination showed that animals in Group C had a significantly greater quantity and superior quality of new bone formation

compared to Groups B and A. These findings were further corroborated by scanning electron microscopy, which supported the radiological and histological results, demonstrating a well-structured and denser bone matrix in Group C.

Based on the cumulative data, it was concluded that the application of autologous BMNCs can significantly support the healing process of bone defects. Furthermore, the combination of BMNCs with TGF-β_1 was observed to promote a more effective and accelerated bone repair process than BMNCs used alone, indicating a synergistic effect in enhancing osteogenesis and bone regeneration.

SIBPHE-2025/139

Rehabilitative management of crippled companion animals through combined conventional and electroacupuncture therapy

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The present study was undertaken to evaluate the clinical cases of companion animals that exhibited varying degrees of hindquarter weakness and were presented to Teaching Veterinary Clinical Complex, Padmanabhpur, Durg. These animals were brought to the hospital after the attending veterinarians, despite employing routine therapeutic modalities, failed to achieve satisfactory clinical improvement. In most instances, the animals had been suffering for variable durations prior to being referred, reflecting the chronic and often progressive nature of the underlying condition. Upon presentation, each animal underwent a thorough diagnostic workup that included clinical examination, radiological assessment, and detailed neurological evaluation in order to accurately determine the location and extent of spinal involvement. The diagnostic findings revealed a range of spinal disorders. The major affections recorded were vertebral fractures, both with displacement and without displacement, degenerative conditions such as spondylosis, as well as cases of spinal cord compression. Interestingly, a small subset of the affected animals did not show any appreciable abnormalities in the spinal cord upon diagnostic examination, despite manifesting pronounced clinical signs of hindquarter weakness. The treatment regimen comprised administration of methyl prednisolone sodium acetate to reduce inflammation, non-steroidal anti-inflammatory drugs (NSAIDs) to provide analgesia and control pain-associated inflammation, and nervine tonics to promote neuronal health and regeneration. In addition to these

pharmacological agents, electroacupuncture therapy was integrated into the management protocol as a rehabilitative adjunct. The response to therapy was carefully monitored and improvement was primarily assessed on the basis of observable clinical signs such as restoration of motor function, reduction in hindquarter weakness, and enhanced mobility of the animals. From the findings of this clinical study, it can be inferred that electroacupuncture holds promise as a valuable adjunct to conventional therapeutic protocols in the management of spinal disorders resulting in hindquarter weakness. Therefore, electroacupuncture may be considered an effective complementary therapeutic modality for improving the quality of life and functional outcome in crippled companion animals suffering from spinal affections.

SIBPHE-2025/140

Medicinal plant: Importance of Isabgol, *Plantago ovata* Forsk. and their major insect pests

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Blond psyllium, *Plantago ovata* Forsk., popularly known as '*Isabgol'* is one of the important medicinal crops grown in Rajasthan. Out of about 200 species of psyllium available in various parts of the globe, only 10 are found in India. The plant of Isabgol and its products are being used as herbal medicines from the time immemorial in China, Egypt and India for curing many kinds of ailments. The husk yields a colloidal mucilage consisting mainly of xylose, arabinose and galacturonic acid. It is also used for treating constipation and intestinal disorders because it works as a calorie free fibre food promoting regular bowel movement. The crop has also gained value due to blood cholesterol lowering property of its husks. The husk is exported largely to different countries. Gujarat and adjoining part of Rajasthan constitute major isabgol producing region. Jalore, Barmer and Jaisalmer districts of Rajasthan are major producing districts. The low productivity of the crop is attributed to the attack of insect pests. Among the insect pests causing major damage to isabgol crop are aphid, *Rhopalosiphum maidis* (Fitch), field cricket, *Gryllus* sp.; whitefly, *Bemisia tabaci* (Genn.); *Aphis gossypii* Glov, and field termites, *Odontotermes obesus* Rambur and *Microtermes obesi* Holmgren. Isabgol is severely damaged by the aphids through sucking of the cell sap which weakens the plants.

Keywords: *Medicinal plant, Isabgol, insect pest, aphids*

SIBPHE-2025/141

Studies on different germplasm of bael (*Aegle marmelos* L.*)* under sodic soil condition of eastern Uttar Pradesh

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The present investigation was conducted al Main Experiment Station, Department of Fruit Science, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.) during the year 2021-22 and 2022-2023.The experiment was conducted in a Randomized Block Design with three replication considering one plant as a unit. The observations were recorded for their flowering and fruiting behavior and physio-chemical properties comprising quantity and quality characters such as. date of start of flowering, duration of flowering, fruit cracking, fruit length, fruit width, fruit weight, specific gravity, number of seeds/fruit, number of fruits/plants, shell weight, shell thickness, pulp, fruit yield /plant, fruit yield q/ha, T.S.S, acidity, ascorbic acid, reducing sugar, non-reducing sugars and total sugars were estimated. From the findings of the present investigation, it can be inferred that the initiation of flowering was recorded earliest inN.B.-9, N.B.-16 and Pant Aparna (2^{nd} week of March) than that of other varieties. The maximum flowering duration among the varieties was recorded in CIAH-B-1 (39 days) followed by N.B.-16 (38days), whereas, the minimum duration of flowering was observed in N.B.-9 (19days), N.B.-5 (19days) followed by N.B.-8 (21days). Maximum fruit cracking was observed in N.B.-9 (39.17 %) followed by N.B.7 (14.88 %), whereas, the minimum fruit cracking was observed N.B.-4 (13.93 %).Maximum fruit length was observed in N.B.-7 (29.5 cm.) followed by N.B.-22 (28.20 cm.), whereas, the minimum fruit length was observed N.B.-4 (16.50 cm.) followed by N.B.-16 (17.20 cm.). Maximum fruit width was observed in N.B.-7 (28.00 cm.) followed by N.B.-17 (27.60 cm.), whereas, the minimum fruit width was observed N.B.-4 (15.90 cm.) followed by N.B.-16 (17.00 cm.).

Keywords: *Germplasm, Bael (Aegle marmelos L.) Sodic soil, Eastern Uttar Pradesh*

SIBPHE-2025/142

Effect of Nitrogen and Potassium Level on Yield of Pearl Millet (Pennisetum Glaucum *L.*) Under South-Western Rajasthan Condition

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The present study entitled "Effect of nitrogen and potassium level on yield of pearl millet *(Pennisetum glaucum L.)* under South-Western Rajasthan condition*"* was conducted during the kharif season of 2024 at the College Farm, College of Agriculture, Madhav University, Pindwara. The trial was laid out in a Randomized Block Design with three replications, comprising eight treatments: T_1 (Control), T^2 [RDF 60:30], T_3 (60 kg N ha^{-1} + 20 kg K_2O ha^{-1}), T_4 (80 kg N ha^{-1} + 20 kg K_2O ha^{-1}), T_5 (100 kg N ha^{-1} + 20 kg K_2O ha^{-1}), T_6 (60 kg N ha^{-1} + 40 kg K_2O ha^{-1}), T_7 (80 kg N ha^{-1} + 40 kg K_2O ha^{-1}), and T_8 (100 kg N ha^{-1} + 40 kg K_2O ha^{-1}). The soil of the experimental field was sandy loam, low in nitrogen (223 kg ha^{-1}), medium in phosphorus (35 kg ha^{-1}), high in potassium (319 kg ha^{-1}), medium in organic carbon (0.45%), and slightly alkaline (pH 7.60).Growth and yield attributes were markedly influenced by nutrient application. Plant height at successive growth stages (21, 45, and 75 DAS), number of effective tillers per plant, earhead weight, girth and length of earhead, grain weight per earhead, and number of spikes per m^2 increased significantly with nitrogen and potassium application. Treatment T_8 (100 kg N ha^{-1} + 40 kg K_2O ha^{-1}) consistently recorded the highest values for most traits, remaining statistically at par with RDF (T_2) in several cases. The results clearly demonstrated that higher nitrogen and potassium levels improved pearl millet growth and productivity under the sandy loam soils of South-Western Rajasthan. These findings highlight the importance of balanced nutrient management, especially adequate nitrogen coupled with potassium, in realizing higher yield potential of pearl millet in semi-arid regions.

Keywords: *Pearl millet, Nitrogen, Potassium, Growth, Yield, South-Western Rajasthan*

SIBPHE-2025/143

Effect of Different Plant Spacing and Pinching on Growth, Flowering and Yield of Marigold (Tagetes erecta *L.*) cv. Pusa Narangi Gainda

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The present investigation entitled **"Effect of Different Plant Spacing and Pinching on Growth, Flowering and Yield of Marigold (Tagetes erecta *L.*) cv. Pusa Narangi Gainda***"* was carried out at the Main Experiment Station, Faculty of Agricultural Science and Technology, Integral University, Lucknow (U.P.), during the winter season of 2019–20. The study aimed to evaluate the influence of different spacing and pinching treatments on vegetative growth, flowering, yield, and quality of marigold. The experiment comprised nine treatment combinations of plant spacing [S_1 (50×40 cm), S_2 (50×50 cm), S_3 (50×60 cm)] and pinching [P_0 (no pinching), P_1 (pinching at 20 DAT), P_2 (pinching at 30 DAT)] laid out in a factorial randomized block design with three replications. Observations were recorded on plant growth attributes (plant height, number of leaves, stem diameter, plant spread, branching pattern, fresh and dry weight), flowering traits (bud size, days to bud initiation, days to flowering, pedicel length, flower diameter, period of bloom, and vase life), and yield parameters (flowers per plant, flower yield per plant, plot and per hectare). The results revealed that wider spacing (50×60 cm) and late pinching at 30 DAT (S_3P_2) produced significantly taller plants, more branches, greater plant spread, and higher fresh and dry biomass. This treatment combination also resulted in maximum flower size, flower weight, number of flowers per plant, and ultimately highest flower yield per plant and per hectare. Early flowering (minimum days to bud initiation and first flowering) was observed under closer spacing (50×40 cm) with no pinching (S_1P_0). Vase life of cut flowers was also improved by pinching at 30 DAT. It can be concluded that a combination of wider spacing (50×60 cm) and pinching at 30 DAT is the most effective practice for enhancing growth, yield, and quality of marigold cv. Pusa Narangi Gainda under Lucknow conditions.

Keywords: *Marigold, spacing, pinching, growth, flowering, yield, Tagetes erecta.*

SIBPHE-2025/144

The Role of Probiotic-Rich Food Production on Health and Nutrition of Animals

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Probiotics live microorganisms that confer health benefits when consumed are increasingly recognized for their role in improving gut health, immune function, and nutrient absorption in all organism. Probiotic-rich food production is gaining momentum in animal agriculture as a sustainable strategy to improve animal health, enhance nutritional efficiency, and reduce dependence on synthetic additives such as antibiotics and growth promoters. Probiotic-rich feeds comprising live beneficial microorganisms such as *Lactobacillus*, *Bifidobacterium*, and *Saccharomyces* species are incorporated into animal diets through fermented feed products, silage, yogurt-like supplements, and functional feed additives. This paper explores the role of probiotic-rich food production in promoting optimal health and nutrition across various animal species, including livestock, poultry, and aquaculture. Probiotic-rich foods contribute to improved gut microbiota balance, enhanced digestion, better nutrient absorption, and strengthened immune function. In monogastric animals, such as poultry and pigs, these benefits lead to increased feed conversion efficiency, weight gain, and resistance to gastrointestinal infections. In ruminants, fermented and probiotic-enriched feeds promote rumen stability, fiber breakdown, and milk production. In aquaculture, probiotics play a critical role in water quality management, disease prevention, and growth enhancement. Moreover, probiotic-rich food production aligns with consumer demand for antibiotic-free animal products and environmentally friendly farming practices. However, challenges remain, including variability in probiotic strains, stability during feed processing and storage, and the need for species-specific formulations. Advances in fermentation technology and delivery systems are helping overcome these barriers. Probiotic-rich food production represents a valuable approach to improving the health, welfare, and productivity of animals while contributing to more sustainable and ethical animal agriculture systems.

Keywords: *Probiotics, Aquaculture, Aquatic Health, Antibiotics, Sustainability, Fermentation*

SIBPHE-2025/145

Exploring Biochemical and Electrolyte Markers in Milk for the Detection of Subclinical Mastitis in Dairy Cattle

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Subclinical mastitis (SCM) is one of the most prevalent and economically significant diseases in dairy cattle, primarily due to its asymptomatic nature and the resulting decline in milk yield and quality. The present study was undertaken to evaluate alterations in milk composition, physicochemical attributes, and associated biochemical markers in healthy and SCM-affected cows reared under tropical conditions. In cattle, SCM milk samples showed a significant decline in lactose levels, while fat and protein percentages varied inconsistently between healthy and affected groups. Notably, electrical conductivity (EC) and pH values were consistently elevated in SCM milk, reflecting disruption of the mammary epithelium and ionic imbalance. Enzymatic activities including lactate dehydrogenase (LDH), N-acetyl-β-D-glucosaminidase (NAGase), and alkaline phosphatase (ALP) were markedly higher in high somatic cell count (SCC) groups, indicating mammary tissue damage and inflammatory response. Parallel changes in electrolytes were also evident, with sodium and chloride concentrations significantly increasing, while potassium levels declined in association with higher SCC. Receiver operating characteristic (ROC) curve analysis further demonstrated that lactose, EC, and pH were the most reliable diagnostic indicators of SCM, with area under the curve (AUC) values of 0.871, 0.904, and 0.900, respectively, thereby confirming their diagnostic robustness. These findings establish that simple, non-invasive measures such as EC, pH, and lactose can serve as sensitive biomarkers for the early detection of SCM in dairy cattle, and may offer a practical alternative or complement to conventional SCC-based screening in tropical dairy production systems.

Keywords: *Subclinical mastitis, dairy cattle, somatic cell count, milk composition, electrical conductivity, pH, lactose, enzymes*

SIBPHE-2025/146

Yogic Lifestyle, Immunity, and Functional Foods: Bridging Traditional Knowledge and Public Health

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Immunity has become a cornerstone of public health, especially in the post-COVID-19 era. In India, the Ministry of AYUSH reported a 32% increase in public adoption of herbal and functional foods during 2020–21, reflecting a shift toward traditional health practices. Yogic lifestyle emphasizes *Satvik Ahara* (wholesome plant-based food), daily *Asana-Pranayama*, and mindful living, all of which support immune modulation and disease prevention. Functional foods such as turmeric, ginger, and millets, already part of Indian diets, are increasingly recognized for their antimicrobial and anti-inflammatory properties.

This paper explores the synergy between Yogic practices and functional foods, supported by evidence from NFHS-5 (2021), which highlights a rise in non-communicable diseases linked to poor dietary habits. Yogic discipline, when combined with safe and nutritious food intake, enhances physical resilience, reduces oxidative stress, and supports mental well-being. Bridging traditional Yogic wisdom with modern nutritional science offers a holistic preventive health framework.

The study concludes that integrating Yogic lifestyle with functional foods can significantly strengthen immunity, reduce the public health burden, and create a sustainable model for community well-being in India.

Keywords: *Yoga, immunity, Satvik Ahara, functional foods, public health*

SIBPHE-2025/147

Mindful Eating through Yoga: Addressing Lifestyle Disorders and Food-Borne Illnesses

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India faces a dual burden of malnutrition and lifestyle-related diseases, with 29% of adults overweight and 9.4% diabetic (NFHS-5, 2021). Additionally, FSSAI (2022) reported that 15% of food-borne illnesses stem from unsafe practices. Yoga addresses these issues through the principle of *mindful eating* awareness in food choice, preparation, and consumption.

Yogic texts emphasize *Mitahara* (moderation in diet) and *Satvik Ahara* (fresh, plant-based foods) that prevent overeating, ensure better digestion, and enhance vitality. Contemporary research demonstrates that mindful eating reduces binge eating, improves metabolic health, and lowers stress-induced disorders. By aligning Yogic dietary practices with food safety guidelines, individuals can reduce both overnutrition-related disorders and food-borne illnesses.

This study integrates Yogic philosophy with public health data, illustrating how mindful eating practices could be introduced in schools, workplaces, and community kitchens. The findings suggest that a Yogic framework for mindful eating fosters better nutritional outcomes, minimizes food waste, and supports long-term preventive healthcare.

Keywords: *Yoga, mindful eating, lifestyle disorders, Satvik Ahara, food safety*

SIBPHE-2025/148

Healthy Lives, Sustainable Future: Analyzing the Environmental and Nutritional Benefits of Organic Farming

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Traditional farming, which relies on heavy use of synthetic fertilizers and pesticides, has emerged as a significant factor in environmental degradation. Its effect on natural soil fertility is alarming. The presence of pesticides in food products has raised concerns as it may result in serious illness and is a threat to public health. Contrary to this, organic farming has emerged as a promising and healthy alternative to conventional farming. It employs environmentally friendly approaches to achieve enhanced food quality by reducing dependency on chemical fertilizers and pesticides. Organic farming offers multiple benefits to both the human health and the environment. The nutritional value of organically grown food is often higher, resulting in improved well-being and reduced risk of diseases. In addition, organic farming benefits the environment as it mitigates soil degradation, helps in water conservation and promotes ecological balance. Organic farming is a sustainable solution to costly farming practices in the current scenario of climate change. This paper explores the multifaceted benefits of organic farming and its role in achieving food security while ensuring sustainability and ecological balance.

Keywords: *organic farming, nutrition, sustainable, environment.*

SIBPHE-2025/149

Biofloc Technology - An Economical and Sustainable Aquaculture Model

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Aquaculture is the fastest-growing food sector in the world. With increased intensification, production has gone up, but so has waste generation in the form of metabolites, fecal matter, and uneaten feed. These wastes, when released into the environment, can pollute water bodies. Traditionally, farmers manage this problem either by regularly exchanging pond water with fresh water or by using Recirculatory Aquaculture Systems (RAS) with advanced water treatment. However, RAS is costly and not affordable for many farmers. India is already facing a water crisis, and by 2030 nearly 40% of its population may not have access to drinking water if resources are not used wisely. This highlights the need for zero water exchange systems in aquaculture. Biofloc Technology (BFT) offers a sustainable, eco-friendly, and cost-effective solution. It works by maintaining a suspension of microbial "flocs" through constant aeration and adding carbohydrates, which promote aerobic breakdown of organic waste. These microbial communities mainly bacteria, protozoa, fungi, and detritus—recycle nutrients and form microbial proteins. Fish and shrimp can directly consume these proteins, reducing dependence on external feed. This approach acts like a near "zero-feed system," lowers feed conversion ratio (FCR), and minimizes environmental impact. The benefits of BFT include reduced feed costs, minimal land and water use, better biosecurity, lower disease risk, higher growth and survival rates, and improved crop yield. Overall, BFT is a practical, profitable, and eco-friendly technology for the future of aquaculture.

Keywords: *Sustainable aquaculture, Biofloc Technology*

SIBPHE-2025/150

Water Management Innovations for Healthier Ecosystems Innovative Water Management for Resilient Fisheries and Ecosystem Health

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Sustainable water management is a cornerstone for ensuring the resilience and health of aquatic ecosystems while safeguarding fisheries resources that support food security, livelihoods, and biodiversity. In recent years, rapid industrialization, climate change, and increasing anthropogenic pressures have deteriorated water quality and compromised the productivity of aquatic environments. Innovations in water management now offer promising solutions to restore ecosystem balance and enhance fisheries resources. From integrated watershed approaches and constructed wetlands to the use of biofilters and phytoremediation, environmentally compatible interventions are being increasingly prioritized to reduce nutrient loading, control eutrophication, and revive aquatic habitats. Smart monitoring systems using sensor-based technologies and remote sensing further enable near real-time assessments of water parameters vital for fisheries sustainability. In fisheries resource management, water quality directly governs species distribution, breeding success, and overall aquatic biodiversity. Introducing climate-smart aquaculture practices, such as recirculatory aquaculture systems (RAS), biofloc technology, and integrated multi-trophic aquaculture (IMTA), optimizes water use while minimizing waste discharge into natural water bodies. Additionally, ecosystem-based management models emphasize restoring natural hydrological flows, conserving wetlands, and strategically using reservoir and river basin management practices to sustain both capture and culture fisheries. Policy innovations, community engagement, and stakeholder-based co-management are equally essential to ensure long-term success of these technologies. Overall, water management innovations are not merely technical interventions but holistic strategies that intertwine ecological restoration, sustainable fisheries production, and socio-economic well-being.

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Sustainable Agricultural Technologies for Climate Resilience Sustainable Fishing Methods for Climate Resilience

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Sustainable Fishing technologies play a pivotal role in strengthening climate resilience by enhancing resource efficiency, minimizing environmental degradation, and supporting integrated food systems. For aquatic environment management and fisheries resources management, the application of such technologies extends far beyond terrestrial agriculture, as agricultural practices directly affect water quality, aquatic biodiversity, and fisheries productivity. Nutrient run-off, pesticide contamination, and water abstraction from agricultural lands are major drivers of ecosystem degradation, which in turn disrupt fish habitats, breeding grounds, and wetland ecology. Climate-smart agricultural innovations such as precision irrigation, conservation tillage, organic farming, and controlled nutrient application not only improve soil and crop productivity but also reduce pollutant inflows into rivers, lakes, and coastal ecosystems, thereby safeguarding fisheries resources. Additionally, synergistic approaches such as integrated rice–fish farming, aquaponics, and polyculture systems exemplify how sustainable agricultural technologies can simultaneously support terrestrial and aquatic food production while optimizing water use efficiency. The incorporation of renewable energy solutions like solar-powered irrigation and aeration systems further ensures reduced carbon emissions and improved resilience to climate-induced water scarcity. In fisheries resource management, integration with sustainable agricultural practices helps stabilize aquatic food webs, reduce habitat degradation, and maintain genetic diversity of fish populations.

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Food Safety, Hygiene, and Health: A Multidisciplinary Approach Ecosystem-Based Approaches & Technological Innovations in Fish Processing for Enhanced Food Safety

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Food safety, hygiene, and health are deeply interconnected with the integrity of aquatic ecosystems and the technological processes underpinning fishery product utilization. From the aquatic environment management perspective, the safety and quality of fish products begin in natural waters, where environmental conditions regulate microbial loads, chemical contaminants, and overall ecosystem health. Pollutant discharge, eutrophication, antibiotic residues, and pathogenic organisms emerging from degraded water bodies pose direct risks to fish safety and consequently to human health. Therefore, maintaining healthy aquatic environments through watershed management, pollution control, and water quality monitoring is essential as the first line of defence in ensuring food safety. From the standpoint of fish processing technology, the application of hygienic practices, advanced preservation methods, and international safety standards is critical to prevent contamination and extend shelf life without compromising nutritional quality. Modern approaches such as Hazard Analysis and Critical Control Points (HACCP), rapid microbial detection techniques, and traceability systems help minimize risks throughout the fish value chain. Emerging technologies including high-pressure processing, pulsed light treatment, and biopolymer-based edible coatings further enhance food safety by reducing microbial hazards while addressing consumer demands for minimally processed and eco-friendly products. A multidisciplinary approach integrates these two domains, emphasizing that safe, hygienic, and healthy fish products result not only from post-harvest interventions but also from ecosystem stewardship and sustainable resource management. Aligning policies, technology adoption, and stakeholder awareness ensures that the aquatic food sector can address global challenges of foodborne illnesses, antimicrobial resistance, and environmental degradation. Ultimately, bridging aquatic ecosystem management with innovative fish processing technologies secures a holistic framework for food safety, public health, and sustainable seafood supply chains.

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Design, fabrication, and performance of ohmic heater to process whole milk

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Ohmic heating (OH) is an emerging and innovative thermal processing technology that utilizes the direct passage of electric current through a food matrix, resulting in internal heat generation due to its inherent electrical resistance. This method offers rapid, uniform, and energy-efficient heating, making it highly suitable for liquid, semi-solid, and particulate food systems. In this study, a lab-scale, batch-type ohmic heater was designed and fabricated to evaluate its performance for whole milk processing. The unit consisted of a rectangular stainless steel process chamber with a holding capacity of 7 liters milk, equipped with a pair of stainless-steel electrodes strategically placed to ensure uniform current distribution. The system was operated under controlled voltage and time settings to optimize the heating process.Whole milk (4.1% fat, 8.2% SNF) was processed using the fabricated ohmic heater, and the temperature was raised from 20 to 80°C under varying voltage gradients. Key performance indicators such as heating rate and changes in physicochemical properties including pH, titratable acidity, and sensory quality (overall acceptability) were assessed. Results revealed a rapid heating profile, achieving an average heating rate of approximately 5°C/min, significantly reducing overall processing time compared to conventional heating methods. Ohmic heating caused a slight increase in acidity and a marginal decrease in pH, but these changes remained within acceptable limits for safe milk consumption. Interestingly, the overall sensory acceptability of ohmic-heated milk improved, possibly due to better flavor retention and reduced thermal damage to heat-sensitive components.The study demonstrated that ohmic heating can efficiently pasteurize milk while preserving its nutritional and organoleptic quality. Minimal thermal degradation, reduced fouling, and uniform heat distribution make this technique a promising alternative to conventional thermal processing for the dairy industry.

Keyword: *Ohmic heating, whole milk, pH, titratable acidity, sensory quality*

SIBPHE-2025/154

Assessment and Effect of Heavy Metals on Gill, Liver and Expression Profile of HSP70 Gene of Fishes of Narmada River Jabalpur

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The present study was undertaken to determine / assess the contamination of heavy metals in different six sites of Narmada River in Jabalpur region. The study was conducted for a period of 180 days (September, 2022 to March, 2023). Water samples were collected from different sites: Site A (Near Mangeli Village, opposite site of Gwarighat), Site B (Khirnighat), Site C (Khandarinala), Site D (Gwarighat), Site E (Tilwaraghat) and Site F (Bhedhaghat) for the analysis of water chemical parameters viz., dissolved oxygen (DO), carbon dioxide (CO_2) and total ammonia analysis by standatdard methos. Water samples of different Sites A to F were also assessed for presence of heavy metals by spot test. Liver and gill tissues were collected from all fishes. The gills and liver tissues of fishes showed normal structure in control group (Site A). In the fishes of Site B to F, the gill section showed necrosis of epithelial cells of secondary gill lamellae, and liver necrosis of hepatocytes and vascular degenerations due to presence of heavy metals.

To evaluate the expression of Heat Shock Protein (HSP70), total RNA was isolated from Trizol reagent method. The mRNA was reversely transcribed into cDNA using TAKARA PrimeScript^{TM}Superscript II Reverse Transcriptase (RT). Then quantitative real-time polymerase chain reaction (qRT-PCR) was performed using reported primers. The higher mRNA expression was found in the Khrinighat and Khandarinalasites (1.34 and 1.04) higher than control site and the mRNA expression of HSP70 was down-regulated in fish compared to the control site. The lower mRNA expression was found in the Gwarighat, Tilwaraghat and Bhedaghatsites (0.28, 0.10 and 0.55) as compared to control site.

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Herbal Immunonutrition in Aquaculture: Efficacy of *Tinospora cordifolia* and Polyherbal Diets on Recovery and Growth of *Heteropneustes fossilis*

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Heteropneustes fossilis (H.fossilis), a commercially important freshwater species, is particularly vulnerable to bacterial infections like *Aeromonas hydrophila*. This study aimed to evaluate the efficacy of *Tinospora cordifolia* (*T. cordifolia*) and a multi-herbal formulation (*T. cordifolia*, *Ocimum sanctum*, and *Allium sativum*) as dietary immunostimulants to enhance recovery and growth in diseased *Heteropneustes fossilis*. Diseased fish were segregated into three groups: Group 1 (commercial feed), Group 2(a) (*T. cordifolia* supplementation), and Group 2(b) (multi-herbal diet). Growth performance was assessed using length–weight analysis and linear regression modeling over a 90-day period. Group 1 showed inconsistent and negative allometric growth with low R^2 values over time, indicating poor feed efficiency and disease progression. In contrast, Group 2(a) exhibited consistent positive allometric growth ($b > 1.3$), high R^2 values (>0.83), and complete symptom regression within 25–30 days. Group 2(b) displayed a delayed but ultimately superior response, with a slope of 4.691 and R^2= 0.736 at 90 days. These findings suggest that *T. cordifolia*, either alone or in combination with other herbs, significantly enhances immune recovery, nutrient utilization, and somatic growth. The herbal diets promoted early disease symptom regression, improved length–weight trajectories, and supported theoretical models of immunonutrition. Future research should explore dose optimization and feed palatability for large-scale applications. Herbal immunostimulants offer a sustainable, antibiotic-free alternative for enhancing fish health in intensive aquaculture systems.

Keywords: *Aquaculture, multi-herbal formulation, Dietary immunostimulant, immune recovery, fish health.*

SIBPHE-2025/156

Occupational Health and Hygiene Practices among Gardeners: Safeguarding Workers and Community Well-being

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In order to preserve the ecological harmony and aesthetic appeal of both public and private green areas, gardeners are considered the real artists. However, their job frequently entails using sharp tools and equipment, repetitive tasks in awkward postures, direct contact with soil, fertilizers, allergic weeds and pesticides, as well as extended exposure to harsh weather conditions. These elements result in serious hygiene-related concerns, such as skin infections, respiratory problems, and chemical exposure, in addition to causing musculoskeletal ailments and physical strain. This study used activity profiling, ergonomic assessments, and interviews to evaluate occupational health and hygiene concerns among 100 gardeners at GB Pant University of Agriculture and Technology. High-risk occupations with significant postural strain and hygienic risks included weeding, grass cutting, bed construction, and rose budding. The results showed inadequate training in safe tool and agrochemical handling, low understanding of occupational hygiene procedures, and no use of personal protective equipment (PPE). Since gardeners ensure long-term maintenance of clean and hygienic surroundings, addressing these issues is essential for the community as a whole as well as for the health of gardeners. Using a multidisciplinary approach that incorporates environmental safety, hygiene, and occupational health, the study suggests focused treatments such as ergonomic training, PPE distribution, and awareness campaigns. This study emphasizes the connection between public hygiene and worker health, underscoring the significance of inclusive safety measures for all sectors that contribute to the well-being of the community.

Keywords: *Occupational health, Gardeners, Hygiene practices, Musculoskeletal discomfort, Suggestive approach*

SIBPHE-2025/157

Salinity Tolerant Varieties for Climate Resilient Agriculture

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Soil salinity is a major abiotic stress limiting crop productivity and threatening global food security, particularly in arid and semi-arid regions. . Therefore, creating salt-tolerant cultivars is a key tactic in the pursuit of climate-resilient agriculture. The focus of physiological techniques is on identifying and choosing characteristics that help plants adapt to saline environments. In order to prevent oxidative damage, they include ion homeostasis (Na+ and K+ regulation), osmotic adjustment through the accumulation of suitable solutes (proline, glycine betaine, and carbohydrates), preservation of photosynthetic efficiency, and improved antioxidant defence systems. Finding donor parents for breeding projects is made possible by screening genotypes for these physiological characteristics in both controlled and field settings. Tissue culture techniques offer effective resources for producing and choosing salt-tolerant variations more quickly. Finding tolerant cell lines that can grow back into entire plants is made easier by *in vitro* selection utilising callus, cell suspensions, or somatic embryos in saline media. Methods like protoplast fusion, micropropagation, and somaclonal variation broaden the genetic basis and make it possible to incorporate tolerance traits. Additionally, tissue culture provides a platform for genetic transformation, enabling the introduction of potential salt tolerance genes. Integrating physiological screening with tissue culture techniques not only enhance the efficiency of conventional breeding but also provide resilient crop options capable of thriving in saline environments.

Key words: *salinity, tissue culture, climate resilient agriculture.*

SIBPHE-2025/158

Non-Chemical Approaches for Sustainable Management of Diamondback Moth (*Plutella xylostella* L.) In Cruciferous Crops

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The diamondback moth (*Plutella xylostella* L.) is a major pest of cruciferous crops worldwide, causing severe yield losses and developing rapid resistance to conventional insecticides. Sustainable pest management strategies increasingly emphasize non-chemical approaches to reduce pesticide dependence and delay resistance development. Cultural practices such as crop rotation, intercropping, trap cropping, and the use of resistant cultivars effectively reduce pest colonization and feeding damage. Biological control by natural enemies, including parasitoids (*Diadegmasemiclausum*, *Cotesia plutellae*) and predators, contributes significantly to the natural regulation of populations. Microbial control agents like *Bacillus thuringiensis* (Bt), entomopathogenic fungi, and nucleopolyhedroviruses provide eco-friendly and effective alternatives to chemicals. In addition, pheromone-based tools such as mass trapping and mating disruption have emerged as promising strategies for suppressing moth populations. Collectively, these non-chemical approaches form the backbone of integrated pest management (IPM) programs, offering a sustainable pathway to manage DBM while conserving biodiversity, ensuring food security, and reducing ecological risks.

Keywords: *Diamondback moth, non-chemical management, cruciferous crops, biological control, microbial agents, integrated pest management.*

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Salfi The Energy Drink : Nutritional Prospects and Religious Beliefs

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Caryota Urens palm sap is healthy and energy soft drink underutilized.The *Caryota Urens* trees are widely available in the Bastar region of Chhattisgarh State. The palm tree sap is commonly known as Salfi or Bastar beer in this region. Commonly, the collection of tree sap is performed early morning and late evening twice in a day. Salfi, a fermented beverage, holds a special place in the lives of tribal communities in Bastar. It is consumed during festivals, marriages, and other ceremonies, reflecting its cultural significance.The Salfi tree provides a source of income for many farmers in the region. Salfi sap is having many extensive health benefits such as reducing blood pressure, improving vitality lowering the risk of anemia, being ideal for diabetic patients, enhancing skin and liver health as it possess nutritional potential. The nutritional composition of *C.urens* has total sugar 16-16.4 (g), reducing sugar 0.76-0.90 (g), pH 6.5, protein as 1.79-2.27 (g), total phenols 0.17-020 (mgGAE), antioxidant activity 0.58-1.15 (mMTE), vitamin 'C' 24-30 (mg). The high sugar and moisture content of salfi leads to quick fermentation due to its composition, harvesting and environmental condition. Fermentation of sugar produces lactic acid resulting alcohol formation. Alcohol production in salfi limits the usage as energy drink among the kids, women pregnant women and non-alcoholic person. The harvesting / extraction and collection, minimal processing, packaging, and storage is challenging in the field. The study has been undertaken to explore the challenging scenario.

Keywords: *Caryota Urens, Salfi, energy drink, nutritional, antioxidant*

SIBPHE-2025/160

Ruby Laser and Its Working

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A ruby laser is a solid-state laser that uses the synthetic ruby crystal as its laser medium. Ruby laser is the first successful laser developed by Maiman in 1960.Ruby laser is one of the few solid-state lasers that produce visible light. It emits deep red light of wavelength 694.3 nm. A ruby laser consists of three important elements: laser medium, the pump source, and the optical resonator. In a ruby laser, a single crystal of ruby (Al2O3 : Cr3+) in the form of cylinder acts as a laser medium or active medium. The laser medium (ruby) in the ruby laser is made of the host of sapphire (Al2O3) which is doped with small amounts of chromium ions (Cr3+). The ruby has good thermal properties.

A ruby laser is a solid-state laser that uses a synthetic ruby crystal as its gain medium. The first working laser was a ruby laser made by Theodore H. "Ted" Maiman at Hughes Research Laboratories on May 16, 1960.Ruby lasers produce pulses of coherent visible light at a wavelength of 694.3 nm, which is a deep red color. Typical ruby laser pulse lengths are on the order of a millisecond.

Keywords: *ruby laser, solid state, pump, medium, sapphire, chromium, thermal, pulse*

SIBPHE-2025/161

Measuring What Matters: Developing a Validated Scale for Institutional Capacity in Farmer Producer Organisations for Sustainable Agrarian Futures

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The aim of the research is to ascertain the content and face validity of the 'FPO's Institution Capacity measurement instrument' using Content Validity Ratio (CVR), Content Validity Index (CVI), and Cohen Kappa Index (CKI) analysis. Six experts were selected based on their experience in agriculture collectives, including FPOs and farmers—the validation process involved seven self-assessed constructs and 35 items. The constructs are the size of FPO, diversity of activities, geographical coverage, organisational structure, financial health, technology adoption, and market integration. After evaluating face and content validity, 32 items met stringent criteria (I-CVI $\geq$0.78, κ^* > 0.75, and S-CVI/Ave $\geq$0.9). A validated instrument that accurately assesses the institutional capacity of FPOs, ensuring it captures essential dimensions influencing effectiveness and sustainability will be developed. It also provides a rigorous methodological framework for future research and policy formulation. This validated scale has significant implications for policymakers, researchers, and practitioners, offering a standardized tool for assessing FPOs' strengths and gaps to enable targeted capacity-building interventions. The instrument can enhance organisational efficiency, market integration, and sustainable agricultural development by facilitating evidence-based decision-making. As a next step, the researchers recommend subjecting the improved 32-item scale to Exploratory Factor Analysis (EFA) in future studies.

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Compositional and Nutritional Profiling of Fruit and Vegetable Wastes for Poultry Feed Development: A Comparative Study with Commercial Feeds

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The current investigation evaluates the nutritional and functional potential of fruit and vegetable wastes (FVWs) as sustainable substitute to conventional poultry feed. The physical characterization of FVWs revealed optimal pH value (5.3-6.6), moisture content (9.7-12.7 %), and water holding capacity (76.3 %) highlighted favourable preservation, digestibility, and stability of the biomass. Biochemical analysis identified potato peels and banana foliage as rich sources of carbohydrates (65.76 %) and poor in lignin, respectively, enhancing their feed suitability. Likewise, pea pods showed the highest crude protein (19.8 %). Further, vitamin analysis revealed carrot pulp and pea pods as potent sources of vitamin A (1520 and 1011 IU/100 g). Fiber content ranged from 2.2 % to 20.6 %, with carrot pulp and apple pomace being the richest sources. Amino acid study highlighted banana foliage and pea pods as nutrient-dense biomass, rich in key amino acids *viz*., leucine, isoleucine, and lysine. The FVW-based feed showed 1.2-1.76 folds higher protein content in comparison to commercial local and branded feeds. Further, FVW-based feed revealed comparable or superior concentrations of essential amino acids like threonine and isoleucine in comparison to both commercial feeds. These findings underscore the inclusion of selected FVWs for poultry feed formulations, offering a cost-effective, nutritionally balanced, and environmentally sustainable alternative to conventional feed resources at an industrial scale.

Keywords: *Fruits and vegetable waste; Poultry feed; Animal health; Protein*

SIBPHE-2025/163

Connecting Nutrition and Agriculture: The Benefits of Small Millets for Sustainable Farming and Human Health

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Small millets, often known as "nutri-cereals," have drawn more attention recently due to their twin benefits of promoting sustainable agriculture and enhancing human nutrition. Finger millet, foxtail millet, tiny millet, barnyard millet, and kodo millet are among the climate-resilient crops that flourish in low-input environments and show resilience to drought, poor soils, and limited water supply.Their agronomic benefits make them viable substitutes for resource-intensive staple crops, promoting both food security and the fight against climate change. In terms of nutrition, small millets are high in minerals including calcium, iron, and zinc, dietary fiber, essential amino acids, and bioactive substances with antioxidant qualities. They are a useful tool for treating malnutrition and lifestyle-related problems because regular ingestion has been associated with lower risks of diabetes, cardiovascular disease, and obesity. Additionally, supporting small millets boosts rural livelihoods, empowers small holderfarmers, and enhances biodiversity.This analysis examines how little millets are beneficial for both nutrition and agriculture, emphasizing how they could be a key component of resilient food systems and healthy communities.

Keywords: *Nutri-cereals, Sustainable agriculture, Climate resilience, Nutritional security, Finger millet (*Eleusine coracana*), Foxtail millet (*Setaria italica*), Low glycemic index grains, Bioactive compounds, Antioxidant activity of millets, Agro-biodiversity conservation and Human health benefits*

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In-vitro Evaluation of Mulberry Plant (*Morus* spp.) for Anticancer Activity

Sadaf Rashid, Shabir Ahmad Wani, M. F. Baqual, Sabiha Ashraf, S. A. Mir, Showkeen Muzamil, Khalid Z. Masoodi.

This study *In-vitro* Evaluation of Mulberry Plant (*Morus* spp.) for Anticancer Activity aimed to evaluate the cytotoxic effects of different solvent extracts of two mulberry genotypes viz. Bota Tul (*Morus alba*) and Shah Tul (*Morus nigra*) against A549 lung cancer cells, using two *In-vitro* assays, namely the MTT assay and the Trypan Blue Dye Exclusion assay, at various concentrations (25, 50, 100 µg/ml for MTT and 40, 80, 120 µg/ml for Trypan Blue Dye Exclusion assay). The MTT assay results revealed that the ethanolic leaf extract of Bota Tul-G1 (G1P1S2) exhibited the highest inhibition percentage, followed by the aqueous leaf extract of Bota Tul-G1 (G1P1S3), with IC50 values of 35.23 µg/ml and 38.36 µg/ml, respectively. The inhibition percentage in the MTT assay progressively increased with higher concentrations of Mulberry plant extracts, indicating a dose-dependent cytotoxic effect. Similarly, the Trypan Blue Dye Exclusion assay confirmed the cytotoxic potential of the extracts, with the highest cell growth inhibition observed for G2P1S3 (aqueous leaf extract of Shah Tul-G2) at 92.67% at 120 µg/ml, followed by G2P2S3 (aqueous bark extract of Shah Tul-G2) at 92.50% and G1P1S3 (aqueous leaf extract of Bota Tul-G1) at 91.67% at the same concentration. Based on the results of both the MTT and Trypan Blue assays, the extracts that demonstrated the highest anticancer activity were selected for further characterization using GC-MS analysis to identify the bioactive compounds. GC-MS identified the presence of various bioactive compounds, including flavonoids, alkaloids, phenolic acids, and sulfur-containing compounds. These phytochemicals are known for their ability to induce apoptosis, inhibit cancer cell proliferation, and exert antioxidant effects. The correlation between GC-MS profiling and *In-vitro* cytotoxicity findings further supports the potential of mulberry extracts as natural anticancer agents. Furthermore, this research highlights the importance of continued investigation into the medicinal properties of *Morus* species. The integration of mulberry extracts into modern medicine could provide a sustainable and eco-friendly approach to cancer therapy, aligning with the growing interest in plant-derived anticancer agents. This study underscores the significance of future studies that should focus on in-vivo investigations and clinical trials to validate the efficacy of these extracts, thereby paving the way for their potential inclusion in cancer treatment regimens.

***Keywords**: Mulberry, Cytotoxicity, Anti-cancer, In-vitro*

SIBPHE-2025/165

Measuring What Matters: Developing a Validated Scale for Institutional Capacity in Farmer Producer Organisations for Sustainable Agrarian Futures

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The aim of the research is to ascertain the content and face validity of the 'FPO's Institution Capacity measurement instrument' using Content Validity Ratio (CVR), Content Validity Index (CVI), and Cohen Kappa Index (CKI) analysis. Six experts were selected based on their experience in agriculture collectives, including FPOs and farmers—the validation process involved seven self-assessed constructs and 35 items. The constructs are the size of FPO, diversity of activities, geographical coverage, organisational structure, financial health, technology adoption, and market integration. After evaluating face and content validity, 32 items met stringent criteria (I-CVI $\geq$0.78, $\kappa^* > 0.75$, and S-CVI/Ave $\geq$0.9). A validated instrument that accurately assesses the institutional capacity of FPOs, ensuring it captures essential dimensions influencing effectiveness and sustainability will be developed. It also provides a rigorous methodological framework for future research and policy formulation. This validated scale has significant implications for policymakers, researchers, and practitioners, offering a standardized tool for assessing FPOs' strengths and gaps to enable targeted capacity-building interventions. The instrument can enhance organisational efficiency, market integration, and sustainable agricultural development by facilitating evidence-based decision-making. As a next step, the researchers recommend subjecting the improved 32-item scale to Exploratory Factor Analysis (EFA) in future studies.

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High-Density Planting and Precision Horticulture for Increased Fruit Productivity

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High-density planting (HDP) combined with precision horticulture practices has emerged as one of the most effective strategies for improving productivity, fruit quality, and resource-use efficiency in modern orchards. HDP systems—using controlled canopy architecture, dwarfing rootstocks, and regulated pruning—can increase plant population by 2–4 times compared to traditional spacing, resulting in substantial early yield gains. In apple and pear orchards, HDP systems planted at 1,600–2,000 trees/ha have shown 45–60% higher yields within the first five years, with cumulative yield advantages exceeding 28–35% over conventional orchards. In tropical fruit crops, such as mango, guava, banana, and pomegranate, HDP trials demonstrate yield improvements of 35–55%, accelerated canopy development, 20–30% enhanced light interception, and better fruit-size uniformity. For example, guava planted at 2 × 1 m density yielded 28–32 tons/ha, compared to 12–15 tons/ha under traditional systems. Precision horticulture tools—soil-moisture sensors, variable-rate fertigation, drone-based canopy mapping, and satellite-derived NDVI monitoring—have further improved orchard productivity. Sensor-based fertigation can reduce fertilizer use by 18–25% and irrigation water by 30–45%, while increasing marketable fruit yield by 12–20%. Laser land-levelling, automated drip systems, and pruning robots have optimized orchard uniformity, reducing labor requirements by 20–35%. AI-supported canopy modelling and yield prediction algorithms have demonstrated 85–92% accuracy, helping farmers plan harvest and market scheduling more efficiently. Despite these benefits, challenges remain in the form of higher initial costs, need for skilled labor, and limited region-specific rootstock availability. Small farmers often struggle with maintenance pruning and training operations required in HDP orchards. Adoption of HDP integrated with precision horticulture can significantly boost fruit productivity, enhance water- and nutrient-use efficiency, and deliver more consistent yields under climate variability. Wider dissemination through training, subsidies, and low-cost technologies will be essential for scaling these systems in developing horticultural regions.

SIBPHE-2025/167

Role of Minimum Support Price in Enhancing Vegetable Production in India

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Vegetable production plays a vital role in ensuring nutritional security, employment generation, and income diversification for Indian farmers. However, price volatility and market uncertainty often discourage farmers from investing in vegetable cultivation. Extending Minimum Support Price (MSP) to vegetable crops can act as a powerful policy tool to stabilize prices, reduce risk, and encourage higher production. MSP provides farmers with assured remuneration, protecting them from sudden price crashes during peak harvest periods when market arrivals are high. This income security motivates farmers to adopt improved varieties, better crop management practices, and increased input use, thereby enhancing productivity and overall production. Assured prices also encourage crop diversification from cereals to high-value vegetables, leading to more efficient use of land and water resources. MSP support can strengthen farmer confidence, particularly among small and marginal farmers, enabling them to expand the area under vegetable cultivation. Additionally, stable prices promote investment in post-harvest infrastructure such as grading, packaging, cold storage, and processing facilities. Implementation of MSP for vegetables can also improve supply chain coordination and reduce distress sales. When combined with effective procurement, market intervention mechanisms, and robust cold chain systems, MSP can help minimize post-harvest losses and ensure consistent market supply. Increased vegetable production supported by MSP contributes to nutritional security by improving availability and affordability of diverse vegetables for consumers. While challenges related to perishability and procurement exist, a well-designed MSP framework tailored to vegetable crops can significantly boost production, farmer incomes, and sustainability of India's horticultural sector.

Key words: *MSP, Enhanced production, Stable prices, Cold chain systems*

SIBPHE-2025/168

Role of Mulches in Enhancing Productivity and Sustainability in Horticulture

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Mulching is an important cultural practice in horticulture that involves covering the soil surface with organic or inorganic materials to improve crop growth and resource efficiency. The use of mulches plays a vital role in modifying the soil microclimate, conserving moisture, and enhancing overall plant performance. Organic mulches such as straw, crop residues, compost, and leaves gradually decompose and improve soil structure, microbial activity, and nutrient availability. Inorganic mulches, including plastic films and gravel, are widely used for effective weed suppression, temperature regulation, and reduction of evaporation losses. Mulching helps maintain optimal soil temperature by reducing extreme heat in summer and protecting roots from cold stress during winter. It also minimizes soil erosion, prevents surface crusting, and improves water infiltration. Weed control through mulching reduces competition for nutrients, light, and water, thereby increasing crop yield and quality. In horticultural crops, mulches contribute to cleaner produce by preventing soil splashing and lowering the incidence of soil-borne diseases. Additionally, the adoption of biodegradable and organic mulches supports sustainable and eco-friendly production systems by reducing reliance on chemical inputs. Overall, mulching is a cost-effective and environmentally beneficial practice that enhances productivity, resource conservation, and sustainability in horticulture.

Keywords: *Mulching, Soil moisture conservation, Weed management, Horticultural crops, Sustainable agriculture*

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Floriculture as a Growing Pillar of the Indian Economy

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Floriculture has emerged as a dynamic and high-potential segment of Indian agriculture, contributing significantly to economic growth, employment generation, and export earnings. With diverse agro-climatic conditions, India possesses a natural advantage for cultivating a wide range of flowers, including roses, jasmine, marigold, chrysanthemum, and orchids. Traditionally associated with religious, cultural, and social functions, floriculture has gradually transformed into a commercial agribusiness driven by rising domestic demand, urbanization, and increasing awareness of ornamental horticulture. The sector plays an important role in enhancing farmers' income due to its high value per unit area and quick returns compared to many conventional crops. Floriculture also supports allied industries such as nursery management, landscaping, perfumery, essential oil extraction, and floral crafts, thereby generating substantial rural and semi-urban employment, particularly for women and small-scale entrepreneurs. In recent years, technological advancements, protected cultivation, and improved post-harvest management have strengthened productivity and quality standards. Furthermore, Indian floriculture contributes to foreign exchange earnings through the export of cut flowers, loose flowers, planting materials, and value-added floral products. Government initiatives promoting horticulture, infrastructure development, and market linkages have further accelerated the growth of this sector. Overall, floriculture represents a sustainable and economically viable avenue for agricultural diversification, rural development, and integration of Indian agriculture with global markets.

Keywords: *Floriculture, Indian economy, employment generation, export potential, horticultural development*

SIBPHE-2025/170

Agrivoltaics A Sustainable Land Use Strategy for Enhancing Food Security

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Agrivoltaics is emerging as a sustainable option towards the rising challenges of food security, energy demand and land use competition through co location of agricultural production and photovoltaic energy generation on the same land area. Agrivoltaic systems combine solar panels and crop cultivation in one area of land, thereby optimizing land productivity and minimizing further stress on high quality arable land. These systems can affect the microclimate through regulation of solar radiation, temperature and soil moisture, which often leads to improved water use efficiency, reduced heat stress and crop resilience under climate change conditions. Shade tolerance and climate sensitivity have been found to be maintained or sometimes even increased with appropriate agrivoltaic configurations, by yielding shade tolerant crops alongside renewable energy. Besides these agronomic advantages, agrivoltaics allow farm income diversification, rural electrification and lower greenhouse gas emissions. While several challenges concerning design configuration, compatibility among crops and initial investment costs still exist, improvements in panel technology and adaptive management practices at the farm level will advance the feasibility and scalability of the system. Overall, agrivoltaics are a promising, multifunctional land use strategy supporting sustainable agriculture, strengthening food security and advancing the transition toward climate smart and energy efficient agri food systems.

Keywords: *Agrivoltaics, food security, sustainable agriculture, renewable energy, land use efficiency, water use efficiency.*

SIBPHE-2025/171

Exploitation of Plant Growth Promoting Rhizobacteria for Sustainable Management of Phytopathogens

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Plant growth promoting rhizobacteria (PGPR) play an important role in the sustainable management of phytopathogens by offering an ecofriendly alternative to chemical pesticides. Beneficial root associated bacteria repress plant pathogens by producing different direct and indirect mechanisms, such as antibiosis, competition for nutrients and niche exclusion, production of lytic enzymes, siderophore-mediated iron sequestration, and interference with pathogen signalling. Furthermore, PGPR may enhance plant defense responses through the induction of systemic resistance and via nitrogen fixation, phosphate solubilization, phytohormone production and/or enhancement of stress tolerance, also improve overall plant vigour. Individual members from the taxonomically and metabolically diverse genera extensively studied so far, e.g., *Pseudomonas*, *Bacillus*, *Azospirillum* and *Rhizobium*, have shown considerable efficacy against fungal, bacterial and nematode phytopathogens in a wide range of crops. PGPR based biocontrol agents integrated into disease management programs contribute to reduced chemical inputs, lower development of pathogen resistance and improved soil health. Improvements in molecular biology, formulation technologies and microbiome research are presently further enhancing the reliability and field performance of PGPR. Overall, the use of PGPR for biocontrol based on these benefits is a promising and environmentally safe way to improve plant health and productivity.

Keywords: *Plant growth promoting rhizobacteria, biocontrol, phytopathogens, induced systemic resistance, siderophores, sustainable agriculture.*

SIBPHE-2025/172

A Comparative Analysis of Hybrid and Individual Time Series Models of Chilli Production in Telangana

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Chilli is a significant agricultural commodity in Telangana, playing a vital role in the state's economy. Accurate forecasting of Chilli production is essential for improving agricultural planning, market strategies, and policymaking. This study explores the application of three prominent time series forecasting models ARIMA (AutoRegressive Integrated Moving Average), SARIMA (Seasonal ARIMA), and Exponential Smoothing along with a Hybrid model that integrates these individual models to enhance predictive accuracy.The analysis was conducted using historical data from 1985-86 to 2024-25, focusing on key variables such as area under cultivation, production (in lakh tones), and yield (in kg per hectare). We evaluate the performance of each model based on Mean Absolute Error (MAE) and Mean Squared Error (MSE), comparing the forecasting accuracy of ARIMA, SARIMA, and Exponential Smoothing. While each model demonstrated certain strengths ARIMA for trend forecasting, Exponential Smoothing for capturing seasonality the Hybrid model, combining all three, produced the most reliable and accurate forecasts. Forecasts were generated for Chilli production (Lakh tones) from 2025 to 2030. The Hybrid model consistently outperformed the individual models, providing a more stable and accurate prediction for the coming years. These findings highlight the benefits of using Hybrid models for agricultural forecasting, particularly for crops like Chilli, where seasonal and trend variations significantly impact production. The results offer valuable insights for policymakers, farmers, and stakeholders in Telangana, aiding in effective decision-making, market planning, and resource allocation for the future.

Keywords: *Chilli production (Lakh tones) forecasting, Telangana, Hybrid models, ARIMA, SARIMA, Exponential Smoothing, Time series analysis.*

SIBPHE-2025/173

Forecasting Cotton Production in Telangana Using Hybrid and Individual Models

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Cotton is a major cash crop in Telangana, contributing significantly to the state's agricultural economy. Accurate forecasting of cotton production is crucial for optimizing resource management, enhancing market strategies, and adapting to climate change. This study investigates the performance of three prominent time series forecasting models ARIMA (Auto Regressive Integrated Moving Average), SARIMA (Seasonal ARIMA), and Exponential Smoothing along with a Hybrid model that combines the strengths of each approach. The analysis is based on historical cotton production data from 1985-86 to 2024-25 in Telangana. The focus is on key production factors such as yield, area under cultivation, and productivity. The study evaluates the individual model performances using standard metrics, including Mean Absolute Error (MAE) and Mean Squared Error (MSE). While ARIMA captures the overall trend effectively, Exponential Smoothing excels in seasonal forecasting. However, the Hybrid model, which integrates ARIMA, SARIMA, and Exponential Smoothing, provides the most robust and accurate predictions. Forecasts for the period 2025 to 2030 reveal that the Hybrid model delivers the most reliable projections for cotton production(Lakh Tones) in Telangana. This study demonstrates the value of hybrid models in reducing forecasting errors and improving decision-making processes. The results are pivotal for agricultural policymakers, cotton farmers, and industry stakeholders in Telangana, helping them plan effectively for the future and address market and climatic challenges.

Keywords: *Cotton production forecasting, Telangana, Hybrid models, ARIMA, SARIMA, Exponential Smoothing,, Market strategies, Forecasting accuracy.*

SIBPHE-2025/174

Seasonal Incidence of Major Insect Pests of Okra (*Abelmoschus esculentus* L.) under Tarai Region of Eastern Uttar Pradesh Conditions

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Okra (*Abelmoschus esculentus* L.), is also commonly known as Lady's finger, which an important vegetable crop belonging to the family Malvaceae, cultivating under tropical and subtropical regions. It is a favourite vegetable in India, and grown in almost all the states in the country. It is an important Zaid (Summer) and Kharif (Winter) season vegetable crop grown throughout the world. Okra fruit is nutritionally very rich with a caloric value of 35/100gm. The present investigation entitled "Seasonal Incidence of Major Insect Pests of Okra (*Abelmoschus esculentus* L.) Under Tarai Region of Eastern Uttar Pradesh Conditions" was carried out during the *Kharif season* 2021-23 at the Research Farm of B.R.D.P.G. College, Deoria (U.P.) affiliated to D.D.U. Gorakhpur University, Gorakhpur, India. The study was designed to analyse the seasonal incidence patterns of major insect pests infesting okra, on the variety 'Arka Anamika' under Large Plot Technique, grown on a 10 m × 10 m (100 m^2) plot, with a spacing of 60 cm × 30 cm rows and plants with weekly observations. Seasonal pest monitoring revealed that Okra shoot and fruit borer (*Earias vittella* F.), Jassid (*Amrasca biguttula biguttula* I.) and Whitefly (*Bemisia tabaci* G.). were the predominant insect pests observed. Okra shoot and fruit borer damage reached highest to 14.75% for shoot infestation in the 31st SMW (Standard Meteorological Week) and 19.47% for fruit infestation in the 35th SMW, Jassid showed a maximum count of 7.02 per 3 leaves in the 36th SMW, while Whitefly populations reached highest to 22.83 per 3 leaves in the 32nd SMW respectively. Okra shoot and fruit borer and Whitefly populations were strongly positively correlated with weather parameters *i.e*., relative humidity and rainfall, while Jassid was strongly positively correlated with weather parameter, minimum temperature.

Keywords: *Okra (Abelmoschus esculentus L.), Major Insect Pests, Seasonal Incidence, Tarai Region, Uttar Pradesh, India.*

SIBPHE-2025/175

Molecular Interactions in Binary Liquid Mixtures

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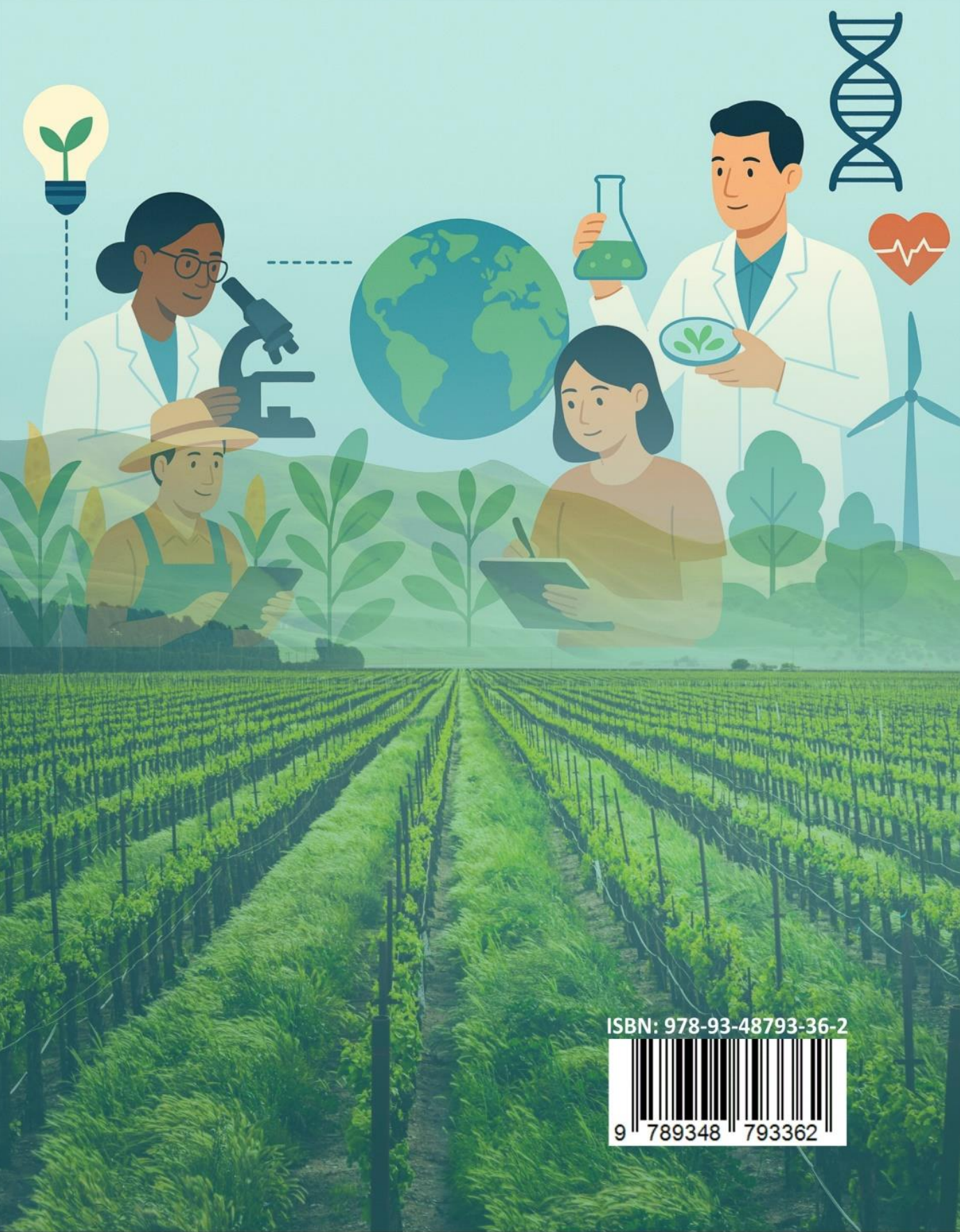
Current research predicting physicochemical behaviour and interpreting intermolecular forces in liquid mixtures require an understanding of departures from ideal. This study investigates excess thermodynamic functions for certain binary mixtures of non-electrolytes at different compositions and temperatures, including excess molar volume (V^2), excess viscosity (η^2), excess Gibbs energy of activation for viscous flow (ΔG^*§), and excess enthalpy (H_0). In order to investigate the impact of hydrogen bonding, dipole interactions, and dispersion forces, the selected systems have combinations of polar and nonpolar components. Standard experimental methods were used to quantify densities and viscosities, and the related excess parameters were assessed. Redlich–Kister type equations were used to model the composition dependence of these features in order to determine binary interaction coefficients and evaluate non-ideal behaviour. Excess function trends were explained in terms of variations in molecular size, structural accommodation and the formation or disruption of intermolecular associations. Negative values of excess functions indicate strong specific interactions and closer molecular packing, while positive values reflect weaker interactions and reduced structural order. Temperature variation further supports the role of competing enthalpic and entropic effects in governing mixture behavior. Overall, the study offers valuable insights into the microscopic interactions of non-electrolyte mixtures and supports the design of efficient solvent systems and industrial formulations.

Key words: *Intermolecular forces, Enthalpy, Interaction coefficients, parameters*



ISBN: 978-93-48793-36-2

9 789348 793362

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