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10th Edition of

Global Congress on

Plant Biology and Biotechnology

"Unveiling the Future of Plant Biology and Biotechnology"

March 26-28, 2026
Singapore

IN-PERSON:

Village Hotel Changi
1 Netheravon Rd,
Singapore 508502

VIRTUAL:

Greenwich Mean Time (GMT)

10TH EDITION OF

Global Congress on

PLANT BIOLOGY & BIOTECHNOLOGY

HYBRID EVENT

26-28 MARCH 2026

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Susmita Shukla
Amity University, India

Thank you All..

Welcome Message

Mohammad Babadoost

University of Illinois, United States

Dear Attendees of the Conference

As a plant pathologist, with more than 30 years of experience, I would like to emphasize that problem-solving in plant pathology is now different than 10, 15, and 20 years ago. Without using biotechnology, accurate identification of plant pathogen species is not possible. For example, for decades, mycologists struggled to established a reliable identification of Fusarium species. It was not possible until 2000s, when molecular analyses of Fusarium isolates helped to offer a reliable classification of Fusarium species. Similar reports have been published on many other plant pathogenic gerens, such as Colletotrichum, Phytophthora, Xanthomonas, etc. The most important step in problem-solving in plant pathology is accurate identification of the causal agents. Plant Biology and Biotechnology Conferences offer broad knowledge in using basic and applied sciences for problem-solving in plant pathology. I am looking forward to seeing you in the **10th Edition of Global Congress on Plant Biology and Biotechnology** scheduled for **March 26-28, 2026 at Singapore.**

Welcome Message

Srinivasa Rao Mentreddy

Alabama A&M University, United States

It is my privilege and honor to welcome you to the 10th **Global Congress on Plant Biology and Biotechnology** at the **Village Hotel Changi, Singapore**. As the global population continues to increase rapidly, the demand for science-based solutions to challenges in agricultural production, product development, and utilization has become both evident and urgent. This comprehensive conference features 35 session topics, including biotechnology and molecular biology, agronomy, and climate change impacts. These topics are essential to enhance the quality and standards of human life through plant biotechnological innovations. In the face of global challenges such as food security and climate change, this conference is our collective quest to harness the power of scientific exchange and innovation. It serves as a dynamic platform where researchers, scientists, students, and industry professionals come together to share groundbreaking ideas and research findings. To immediately spark collaboration, we encourage each participant to introduce themselves to three new peers during the first coffee break and share a recent insight or challenge. This simple action can pave the way for lasting networks and valuable partnerships. Together, we will forge pathways toward what could be—a future where scientific knowledge effectively addresses the pressing issues of population growth and environmental change. On behalf of the organizers, I hope you find this conference both productive and enjoyable, gaining fresh perspectives that align with our common objectives. Let's unite for a sustainable future and nurture the seeds of innovation!

Welcome Message

Dr. Mary Cole

Agpath Pty Ltd, University of Melbourne, Australia

Dear congress visitors.

It is an honour and pleasure to write some welcoming words. At this moment in Australia, we are seeing the impact of climate change along our east coast, with unseasonal rainfall and tropical humidity moving down into Victoria in the south. I have spent my career showing farmers around the world that the regenerative concept of soil health and plant health is compatible with an increasing population. I take so called 'waste streams' and turn them into 'resource streams'. This makes organics available for agriculture leading to improved nutritional values in foods produced. Also, recycling efficiently urban 'waste' into resources that capture carbon, improve food quality, and give farmers a viable future as their capacity to farm effectively becomes increasingly more problematic. The products are most useful in parks and gardens in urban areas so that material does not need to be brought in from a distance at economic and environmental cost but can be composted on-site and used as a resource. We generate too much organic 'waste' so it must be recycled and made into the wonderful resource nature designed it to be. This is a problem in all countries but there are solutions, and they are environmentally sensitive, economically practical and important in the light of changing climate and food security. This conference covers many aspects of modern agriculture with excellent speakers. The venue is beautiful and the delegates engaging.

Welcome Message

Dr. Bijayalaxmi Mohanty

National University of Singapore, Singapore

A very warm welcome to the **10th Edition of Global Congress on Plant Biology and Biotechnology** going to be held in **Singapore from March 26-28, 2026.** I am really honoured to deliver a Keynote speech for this conference. It is indeed a great opportunity for all of us to share and discuss our research work on diverse aspects of plant biology and biotechnology which is crucial for solving our present and future problems related to food security and environmentally sustainable crops. Rice, maize, wheat, sorghum and barley are the major food crops which constitute the world's nutrient requirements. Although the overall yield of such cereals has been increasing, the growing population and adverse climatic changes pose huge challenges for their sustained production. Hence, we need to develop new breeding targets and agronomic traits for improving crop production as well as enhancing nutritional contents and pest resistance. I hope different scientific sessions of this conference would be valuable for all of us in understanding different aspects of biology and biotechnology to solve global challenges.

Welcome Message

Dr. P. E. Rajasekharan

ICAR-IIHR, India

It is with great pleasure and deep professional commitment that I join the 1**0th Edition of the Global Congress on Plant Biology and Biotechnology (GPB 2026)** as a Keynote speaker and session chair. This prestigious event, under the inspiring theme "Unveiling the Future of Plant Biology and Biotechnology ", serves as a pivotal platform to explore the frontiers of plant sciences, where innovation, sustainability, and interdisciplinary collaboration converge.

As we gather in Singapore and online for this hybrid event, we are not only sharing the latest breakthroughs in plant biology and biotechnology but also responding to some of the most pressing global challenges—climate change, food insecurity, ecosystem degradation, and the need for sustainable agricultural systems. GPB 2026 uniquely brings together a vibrant community of plant scientists, biotechnologists, agronomists, geneticists, ecologists, and policy thinkers from academia, industry, and government.

The scientific sessions planned cover an impressive range—from plant molecular biology and synthetic biology to seed technology, crop improvement, and environmental interactions. These discussions are vital as we reimagine agriculture, integrate biotechnology in practical solutions, and enhance resilience in both natural and cultivated systems.

I look forward to insightful exchanges, the celebration of path-breaking discoveries, and the fostering of collaborations that will seed the future of sustainable plant science and biotechnological innovation. Let us use this opportunity to bridge science with impact and vision with action.

Welcome Message

Rameshkumar K B

Jawaharlal Nehru Tropical Botanic Garden and Research Institute, India

Welcome to the **10th Edition of Global Congress on Plant Biology and Biotechnology (GPB 2026).** It's my privilege and honor to be part of the event, and proud to mention that this is the third sequel I am participating. The theme of the conference,"Unveiling the Future of Plant Biology and Biotechnology" is highly relevant and contemporary topic, as groundbreaking discoveries are happening in the area, unravelling the secrets of nature, and also contributing significantly to human well-being. Recent developments in plant sciences are based on an interdisciplinary approach, and plant science research is going through an 'omics' era and the unprecedented progress in phytochemical techniques opened up new avenues for phytochemists to explore boarder areas with plant biotechnology such as chemogenomics and metabolomics. It's my pleasure to share my experience in 'Recent Advances in Phytochemical Techniques' in the event. The conference will definitely act as a platform to orient new directions to the contemporary research in plant science field.

Welcome Message

Dr. Vijayan Gurumurthy Iyer

Techno-Economic-Environmental Study and Check Consultancy Services, India

Dear Conference Attendees of GPB 2026,

It is my great pleasure to welcome you to attend the session entitled Environmental Health Impact Assessment (EHIA) process for tobacco processing plants. Environmental health impact assessment refers the attempt to predict and assess the impact of tobacco development projects, programs, plans, policies, and legislative actions on the environmental health. A component dealing with human health is called an environmental health impact assessment. Environmental health impact assessment emphasizes opportunities for the protection and promotion of environment and human health. EHIA aimed to improve human health in the process of environmental impact assessment. It is recommended that there should be provision of dedicated EHIA education, planning and decision making, policy programs, training and development programs. This session will provide an opportunity for participants to gain knowledge of the challenges and potential solutions to problems that can arise with acute and chronic tobacco diseases in processing plants. Tobacco monitoring and control is suggested for prevention through influencing the four main behavioural risk factors such as tobacco use, unhealthy diet, physical inactivity and harmful use.

Welcome Message

Dr. Balagopalan Unni

GEMS Arts & Science College (Autonomous), India

Dear Conference Delegates

I am very happy to convey my warm greetings, and would like to say a few words about the scientific session entitled Plant biotechnology and application The application of biotechnological tools in plants/crops are now widely used around the globe. The technique is used to create or modify plants for specific applications. The uses are more for crop production in terms of quality and quantity, and free from diseases. The applications also include developing crops with enhanced traits like pest or drought resistance, improving nutritional value and for medicinal compounds too. All these main areas of research being included under different topics such as: Gene Editing/Genome Editing, Genetic structures and mechanisms, Identification of genes and traits, Transgenic biotechnology methods, Plant genome sequences; Molecular markers, and bioinformatics, Recombinant DNA technology in plants and Synthetic Biology. The scientific gatherings at the conference are one of the best opportunities for each and everyone to share their findings.

Welcome Message

J C Tarafdar

ICAR-Central Arid Zone Research Institute, India

Dear conference attendees,

I welcome you all and feel so glad that you are here. Hope, you will enjoy this excellent conference on Plant Biology and Biotechnology. We appreciate having you in attendees and look forward to working with you. Our agenda includes in three days covering entire aspects on plant biology and biotechnology beginning form molecular biology, nutrition, protection, breeding, ecology, artificial intelligence and plant agro-ecosystems. In addition to the introductory Keynote speakers, we have many sessions to understand your goals beside allow you to ask questions during each phase with discussions. This exchange may be a valuable tool in helping all of us to refine our materials to present much better in future. This conference also helps all of us for new connections in our interested fields and discovering additional knowledge on our subject of interest. We look forward meeting you and sharing our knowledge.

Welcome Message

Dr. Abdul Khalil Gardezi

Colegio de postgraduados en Ciencias Agricolas, Mexico

Dear colleagues and distinguished participants,

It is a great pleasure to welcome you to the **10th Edition of the Global Congress on Plant Biology and Biotechnology.** As a researcher focused on beneficial microorganisms for sustainable agriculture, I am honored to join this outstanding scientific gathering that brings together experts committed to advancing plant science and ecological resilience.

In an era where climate variability and soil degradation threaten global food security, the study and application of plant growth-promoting microorganisms offer powerful tools to enhance productivity, restore degraded soils, and reduce the environmental footprint of agriculture. The exchange of ideas, experiences, and innovations that takes place in this forum will undoubtedly contribute to developing more sustainable and intelligent agroecosystems.

I warmly invite you to participate actively in the sessions, share your insights, and explore collaborative opportunities. Together, we can harness the potential of beneficial microbes to transform agriculture into a more productive, resilient, and environmentally responsible system.

Welcome to the congress, and I wish you an inspiring and fruitful event.

Welcome Message

Edgar Omar Rueda Puente

Universidad de Sonora, Mexico

Dear Conference Attendees,

It is my great pleasure to welcome you to attend the session entitled Functional medicine and the agronomic engineer: What it is and how to influence in a society after a pandemic. In the agri-food sector, the main agent is the agricultural engineer, a professional with knowledge and techniques in agri-food systems. However, the economic interests involved in food production often lead to noncompliance with sustainability criteria, resulting in the production of foods with high pesticide content and poisoning of the population that consumes them. This same phenomenon is observed in conventional medicine, where the pharmaceutical sector, along with human medicine professionals, has been weakened; That is, instead of having the opportunities it provides to connect with others and do something for others, it has been promoted more for economic gain than for the benefit of the patient. The alternative to this situation, which is being experienced in both sectors (agriculture and human medicine), is to reduce the use of pesticides in agriculture, moving as close as possible to sustainable and organic agriculture. In human medicine, it is essential to apply the principles of Functional Medicine to our lives, which is the process where the practitioner truly integrates with the patient. It is a medicine that does not focus on the disease, but on the individual, in such a way that it does not cure diseases, but rather creates health and that by reorienting the way we produce food and care for our health, we can give greater meaning to our lives. A conference with the Global Scientific Guild, where science meets wisdom. It is a conference enriched by the principles of Dr. Alexander Krouham, a world expert in functional medicine, in addition to considering the experiences of researchers in food and production.

About
Magnus Group

About

Magnus Group, a distinguished scientific event organizer, has been at the forefront of fostering knowledge exchange and collaboration since its inception in 2015. With a steadfast commitment to the ethos of Share, receive, grow, Magnus Group has successfully organized over 200 conferences spanning diverse fields, including Healthcare, Medical, Pharmaceutics, Chemistry, Nursing, Agriculture, and Plant Sciences.

The core philosophy of Magnus Group revolves around creating dynamic platforms that facilitate the exchange of cutting-edge research, insights, and innovations within the global scientific community. By bringing together experts, scholars, and professionals from various disciplines, Magnus Group cultivates an environment conducive to intellectual discourse, networking, and interdisciplinary collaboration.

Magnus Group's unwavering dedication to organizing impactful scientific events has positioned it as a key player in the global scientific community. By adhering to the motto of Share, receive, grow, Magnus Group continues to contribute significantly to the advancement of knowledge and the development of innovative solutions in various scientific domains.

About GPB 2026

About

Welcome to the **10th Edition of Global Congress on Plant Biology and Biotechnology (GPB 2026)**, taking place in **Singapore,** and online from **March 26-28, 2026.** This year's conference, themed **"Unveiling the Future of Plant Biology and Biotechnology".** The conference offers a comprehensive program featuring keynote talks, oral and poster presentations, and interactive discussions.

As you explore this abstract book, you will find a collection of pioneering research and insights that capture the dynamic nature of this year's conference. Each abstract provides a glimpse into the significant advancements and innovative work driving progress in Plant Biology and Biotechnology. Whether you are participating in-person or virtually, you will have the opportunity to connect with leading experts and peers, fostering discussions that will shape the future. We eagerly anticipate your engagement in this transformative event and the valuable contributions you will bring to the field.

About
CPD Accreditation

About

Continuing Professional Development (CPD) credits are valuable for GPB 2026 attendees as they provide recognition and validation of their ongoing learning and professional development. The number of CPD credits that can be earned is typically based on the number of sessions attended. You have an opportunity to avail **1 CPD credit for each hour of Attendance**.

Some benefits of CPD credits include:

Career advancement: CPD credits demonstrate a commitment to ongoing learning and professional development, which can enhance one's reputation and increase chances of career advancement.

Maintenance of professional credentials: Many professions require a minimum number of CPD credits to maintain their certification or license.

Increased knowledge: Attending GPB 2026 and earning CPD credits can help attendees stay current with the latest developments and advancements in their field.

Networking opportunities: This conference provides opportunities for attendees to network with peers and experts, expanding their professional network and building relationships with potential collaborator.

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KEYNOTE PRESENTATIONS

Abdul Khalil Gardezi[1*], Leticia Manuela Inzunza-Medina[1], Guillermo Carrillo-Castañeda[1], Héctor Manuel Ortega-Escobar[1], Oscar Raúl Mancilla-Villa[2], Juan Enrique Rubiños-Panta[1], Sergio Roberto Marquez-Berber[3], Héctor Flores-Magdaleno[1], Jorge Flores-Velazquez[1], Gabriel Haro-Aguilar[1]

[1]Colegio de Postgraduados. Carretera México-Texcoco km 36.5, Montecillos, Texcoco, Estado de México, C. P. 56230, México
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[3]Universidad Autónoma Chapingo. Carretera México-Texcoco km 38.5, Chapingo, Texcoco, Estado de México, C. P. 56230, México

Biography: Dr Abdul Khalil Gardezi is a distinguished scientist and academic member of the Hydro science Center, Postgraduate College in Agriculture Science in Mexico, since 1981. He has received distinctions for teaching, research and service from 1988 until 2025. He has been selected for the originality of his research, presented as the best paper and oral presentation from 2003 until 2024 in international congresses in USA, Dubai, France, Spain, England, Germany, Mexico, Nederlands, Switzerland, Singapore, and Australia. He has published more than 200 papers internationally. He has been honored among 2000 outstanding intellectuals of the 21st century by the International Biographical Center Cambridge, England.

Bacterial consortia promote tomato development and bioremediation in soils with heavy metal pollution

The use of wastewater in agriculture has emerged as an alternative to address water scarcity and ensure food security. While crops under these conditions can be negatively affected, they also offer potential for reducing heavy metal accumulation in soils. Plant Growth-Promoting Rhizobacteria (PGPR) are bacteria associated with roots that enhance plant development. This study evaluated the effect of three bacterial consortia on the germination, growth, and development of three tomato varieties, as well as their potential role in biological remediation of soils irrigated with wastewater.

The research was conducted in three stages: First, seed viability was assessed under CuSO4 exposure, pre-germinative treatments, and bacterial inoculation; Second, seedling vigor was determined; Third, plants were grown in a greenhouse for 120 days in soil irrigated with wastewater. Germination was influenced by temperature, seed hydration, and storage time. Seedling responses *in-vitro* and in the greenhouse were consistent. Consortia 1 and 3 positively affected seedling growth. In the greenhouse, consortium 1 enhanced stem length and diameter, root length and volume, and aerial biomass in R.G. 22. Consortium 3 promoted stem and root length, aerial biomass, and leaf area in R.G. 19. In R.N. 22, both consortia increased leaf number, root length and biomass, and aerial biomass compared to the control. These results demonstrate that selected bacterial consortia can effectively promote tomato growth and development, offering a sustainable strategy for enhancing crop productivity and supporting soil remediation in wastewater-irrigated systems.

Dr. Balagopalan Unni

GEMS Arts & Science College (Autonomous), Malappuram, 679321, Kerala India, Adviser-Research, Assam downtown University, Gauhati-781026 Assam, India

Biography: Balagopalan Unni is a Former Chief Scientist (DADD and Fulbright Fellow) retired from CSIR North East Institute of Science & Technology. Assam, and then appointed as Adviser Research at Assam downtown University and as Director, Research at GEMS College of Arts & Science (Autonomous), Kerala, India. Ph.D (Biochemistry) Allahabad University, and PDF (Molecular Biology) Texas A&M University, USA. Specialized in Molecular Biology too. Published 135 papers 200 abstracts, 48 papers in proceedings, 7 patents, 1 technology. 18 chapters in books, edited 7 books, and guided 30 students for PhD. Visited USA, Germany, Israel, Jordan, France, Morocco, UK, Thailand, Malaysia, Greece, Jordan, Singapore, China & UAE.

Isolation and functional properties of biomolecules of plants and its application

The biodiversity of the North-East is very rich with 50% of the country's flora and fauna and includes wild relatives of 132 identified and economically important species besides a large number of primitive plants and animals. Large number of biologically important molecules could be harvested from plants and used against various types of insect pests, disease and for other useful properties. Some of the plant based molecules isolated, and their functional properties against various types of diseases in plants and insects were discussed in this presentation. Fusarium wilt of tomato (*Lycopersicon esculentum*) caused by Fusarium oxysporum f. sp. lycopersici is among one of the serious diseases. It causes vascular wilts by infecting plants through the roots and growing internally and in severe cases blocks the vascular bundles. The fungus can be soil borne, airborne or carried in plant residue and can be recovered from any part of the plant from the deepest root to the highest flower. Fusarium wilt pathogens were isolated from vascular sections of diseased tomato plants collected from different parts of Assam. Using the universal primers ITS1 and ITS4, amplification was done for the 18SrRNA, ITS1, 5.8S rRNA, ITS2 and partial 28SrRNA region. RAPD was also carried out to study the diversity of these isolates. A total of 40 random 10 mer primers were screened for RAPD study. Dendrogram was constructed based on the banding patterns of all the isolates under study. Further, we have developed a SCAR marker. This can help in the detection of pathogenic isolates of Fusarium wilt causing pathogens of tomato from the non-pathogenic

ones and other soil borne fungi. Crude chloroform extract of Piper betle L. was used for control of Fusarium wilt in tomato. This extract was observed to be efficient in reducing Fusarium population in soil as compared to that of carbendazim. Fusarium wilt control studies were carried out in a greenhouse. A comparative study on the antimicrobial properties of plant extracts obtained by different methods was also performed in order to choose the most efficient -antimicrobial compounds for *in-vitro* control of the bacteria. *Chebulic myrobalan (Terminalia)* and garlic extract was found to be effective in controlling the disease and to enhance the silk production in silkworm. The treatment of *T. chebula* on food plants of muga silkworm has an indirect or direct impact on the growth of silkworm that ultimately affects the quality and quantity of the silk produced. This plant based extract is called Muga–Heal is found to be helpful at the field level for the muga farmers to control the most dreaded disease Flacherie, and to enhance the silk production. The medicinally important plants such as Centella asiatica, Oxalis corniculata, Leucus aspera and Murraya koenigii which are used as indigenous source of vegetables, and the presence of phytochemicals showing the antioxidants properties along with other plant based biomolecules will be presented and discussed.

Dr. Balagopalan Unni

GEMS Arts & Science College (Autonomous), Malappuram, 679321, Kerala India, Adviser-Research, Assam downtown University, Gauhati-781026 Assam, India

Biography: Balagopalan Unni is a former Chief Scientist (DADD and Fulbright Fellow) retired from CSIR North East Institute of Science & Technology. Assam, and then appointed as Adviser Research at Assam downtown University and as Director, Research at GEMS College of Arts & Science (Autonomous), Kerala, India. He holds a Ph.D (Biochemistry) Allahabad University, and PDF (Molecular Biology) Texas A&M University, USA. Unni Specialized in Molecular Biology & Published 135 papers 200 abstracts, 48 papers in proceedings, 7 patents;1 technology & 18 chapters in books, edited 7 books, and guided 30 students for PhD. Visited USA, Germany, Israel, Jordan, France, Morocco, UK, Thailand, Malaysia, Greece, Jordan, Singapore, China & UAE.

Natural plant bio-resources and its medicinal properties

North East India is considered to be the biological gateway for much of India's flora and fauna. As a result it is one of the richest in biological values, high in endemism and holds a large number of rare species that are now under serious threat. Hotspots are areas that are extremely rich in species, have high endemism and are under serious threat due to human activities. Endemism refers to an ecological word of being unique to a defined geographic location. Such as an island, nation, etc. The North East is among the 34 Hotspots of the world. If the natural resources are not maintained, the balance of nature will be disturbed. Once this is lost it will lead to many problems. The natural resources can be commercially used to foreign exchange linked with tourism. The preservation of natural resources helps to study morphology, anatomy, physiology, ecology of the different species. Wild animals provide the best means of sports and recreation. The natural resources are the only assets of North East India. Therefore it must be a mandatory principle of every citizen to conserve and utilize the natural resources with proper management.

The North-Eastern region is known for its vast natural resources. The landlocked North East region of the country comprises eight separate states which characterizes the transition zone between the Indian, Indo-Malayan and Indo-Chinese biogeographic regions and a meeting place of the Himalayan Mountains and Peninsular India. Medicinal plants constitute an

important therapeutic aid in alleviating ailments. Herbal medicine is still the mainstay of about 75-80% of the world population, mainly in the developing countries for primary health care because of better cultural acceptability, better compatibility with the human body and lesser side effects The active constituents extracted from the plants can be used for production of semi synthetic drugs and that is having medicinal properties used in the health sector

The present work is the result of intensive study of some of the medicinal plants of the North East region. Few of the medicinal plants used for health care and its habitat have been explained here. However, a large number of such plants are yet to be identified and studied in detail for their ethno-botanical aspects.

Charu Agnihotri, Bhim Pratap Singh*

Department of Agriculture and Environmental Sciences, NIFTEM-Kundli, Haryana, India

Biography: Dr. Singh is working as a Professor and Head, Department of Agriculture and Environmental Sciences at National Institute of Food Technology Entrepreneurship and Management (NIFTEM), Kundli, Haryana, India, and has more than 20 years of experience in applied microbiology with a special focus on endophytic microorganisms and their applications in agriculture and health sciences. Dr. Singh explored the indigenous fermented products of Northeast India and isolated several probiotic strains, and characterized them. Currently, his group is exploring these isolated strains for their potential to synthesize neurotransmitters such as GABA, serotonin, dopamine, and SCFAs, and is incorporating these strains into functional beverages using co-encapsulation technology. Dr. Singh has published more than 100 research articles and is a part of the Global Burden of Diseases Collaborators. Dr. Singh edited 08 books with Elsevier and Springer on different aspects of applied microbiology.

Toward a circular bioeconomy: Sustainable utilization of mushroom processing residues

Utilizing mushroom byproducts is a sustainable strategy that turns waste into valuable resources, thereby further enhancing economic viability. The mushroom industry generates 10-20% of processing byproducts in the form of stems/stipes, trimmings, and deformed fruiting bodies, which have almost equivalent nutritional properties. In this regard, the byproducts of *Agaricus Bisporus* Stipe (ABS) were studied for their potential as ingredients in nutritional and functional food preparations. The proximate analysis of the stipe and full fruiting body extracts has been undertaken. Antioxidant activities, measured by DPPH, ABTS and FRAP assays. Metabolic profiling of the extracts indicates they are rich in β-glucans and proteins. The LC/MS QTOF analysis of ABS and AES revealed the existence of almost similar bioactive compounds as compared with the main fruiting bodies. Alternatively, mushroom production byproducts are used to produce vegan chitosan, an important biopolymer with various applications in the food industry. The potential of using different emerging technologies on the production yield and bioactivities was also considered. This sustainable approach highlights the potential of mushroom waste valorisation to align with global goals by reducing waste and enhancing resource efficiency.

Keywords: *Agaricus Bisporus Stalk* (ABS), *Lentinula Edodes* Stipe (LES), Sustainability, Bioactive Compounds.

Bijayalaxmi Mohanty

Environmental Research Institute, National University of Singapore, Singapore

Biography: Bijayalaxmi Mohanty received her MSc and MPhil degree from Utkal University, Bhubaneswar, India in 1983 and 1985 respectively and PhD degree from the University of Cambridge, UK in 1991. She is currently a Visiting Research Scientist at the NUS Environmental Research Institute, National University of Singapore, Singapore. Her main research interests focus on the abiotic stress tolerance in rice and other plants, plant genomics, metabolic and transcriptional regulation, integrative omics approaches to different abiotic stress conditions and plant modeling. She is the Associate Editor for Current Plant Biology, Plant Biophysics and Modeling, Frontiers in Plant Science, Crop Design and Review Editor for more than 30 internationally referred journals.

Plant systems biology: Application to rice for understanding drought stress response mechanism during vegetative, reproductive and grain-filling stages

Rice is one of the major global food crops. Although the overall yield of rice has been increasing, the growing population and adverse climatic changes pose huge challenges for their sustained production in the future. Drought stress severely affects rice production worldwide. It affects all stages of rice growth and development including vegetative, reproductive, and grain-filling stages. Therefore, systematic approaches are highly required to explore their effects on rice phenotypic and cellular responses. It could be achieved by combining the available multiple high throughput data such as genomics, metabolomics, proteomics and transcriptomics, thereby analysing the possible biochemical adaptations to several abiotic and biotic stresses, and subsequently improving the crop yield. We have employed similar systems biology approach and initially developed a core mathematical model of rice to characterize cellular behaviour and metabolic states under drought stress conditions. The core model was then further expanded to reconstruct a fully compartmentalized genome scale metabolic model. Subsequently, transcriptomics data were systematically integrated with the model to identify the potential candidate regulatory genes. Critical Transcription Factors (TFs) such as AP2/ERF, bZIP, MYB and NAC that control important gene regulatory pathways were identified through analysis of the patterns of spatio-temporal expression and cis- element enrichment for rice plants subjected to drought stress during tillering, booting

and panicle elongation stages. Similarly, important TFs such AP2/ERF, bZIP, bHLH, CRF, MYB, NAC, WRKY and ZnF were identified for rice leaves moderately tolerant to drought during grain-filling stage. Moreover, identification of genes and cis- elements associated with brassinosteroid signaling pathway indicates a key role in drought tolerance during grain- filling stage. The information gathered from these analyses can guide the breeding of new rice varieties in response to drought tolerance during both vegetative and reproductive stages, leading to improved rice production.

Keywords: Rice, Systems Biology, Genome Scale Metabolic Model, Drought Stress, Candidate Genes, Transcription Factors.

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Biography: Didier Lesueur earned his PhD in Plant-Soil-Microorganism interactions from the University of Paris VI (Pierre & Marie Curie) in 1992. Since then, he has held various positions, including working at the BSFT laboratory at CIRAD in France from 1992 to 1996, IRD-Dakar in Senegal for eight years (1996-2004), and CIAT-TSBF in Nairobi, Kenya, for six years (2004-2010). He then worked at LDD-Bangkok in Thailand for five years (2011-2016) and is currently based at the Alliance of Bioversity International and CIAT's Asia Hub in Hanoi, Vietnam, where he has been employed since August 2016. Throughout his career, Didier has led research in soil microbiology, focusing on biological nitrogen fixation and the use of beneficial microorganisms to inoculate legumes and other crops in agroecological systems related to nutrient cycles. He has extensive field experience, spending 15 years in Africa and over 14 years in Southeast Asia. Currently, he is coordinating the CMBP Asia-Pacific network on microbial biotechnologies, which aims to develop soil biological indicators to improve soil health management for farmers. Didier has co-authored over 130 refereed journal articles and book chapters, and he has trained more than 15 PhD students and 50 MSc students from Europe, Asia, and Africa. Editorial Board of the journal Plant and Soil Editorial Board of the journal World Journal of Microbiology and Biotechnology.

What key scientific and technical barriers hinder farmers from fully embracing the benefits of commercial biofertilizers?

In an ideal environment, plants and soil microorganisms engage in permanent interactions through various complex mechanisms. Microorganisms benefit from the products of plant photosynthesis, while plants receive nutrients from the soil, aided by these microorganisms. Unfortunately, most agricultural systems rely heavily on chemical inputs, such as fertilisers, pesticides, herbicides, and insecticides. This dependence makes the system unsustainable, leading to negative environmental consequences, including loss of soil biodiversity, soil acidification, and diminished storage of soil organic carbon.

One potential solution is the application of commercial bioinoculants containing beneficial microorganisms. These microorganisms can help plants become more resilient to environmental stresses, mineral deficiencies, and pathogens. While current literature contains numerous studies demonstrating the significant effects of these bioinoculants under controlled conditions, there is a lack of similar evidence in real farm conditions, where solutions are most needed. Various explanations have been offered to account for this gap, but there is hope for improvement. We will highlight what needs to be addressed in the near future to enhance the effectiveness of bioinoculants and convince farmers to invest in high-quality options that can lead to increased crop yields.

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Biography: Dr. Edgar O. Rueda Puente has a Level 3 in the National System of Researchers in Mexico; knowledgeable about the needs of our American Continent, and absolutely consistent with the National Development Plan in the Mexican Republic (2017-2026); Awarded with the Degree Doctor Honoris Causa by the International Organization for Inclusion and Educational Quality (OIICE). Qualified to Audit and Implement Institutional Management Systems, under the Standards Listed Below; Supported By The institution: which is accredited by the Mexican Accreditation Entity (MAE: ISO 9001:2015; ISO 14001:2015; ISO 21001:2018; ISO 50001; ec0217 Competence Standard–CONOCER. Member of the Intersecretarial Commission on Biosafety of Genetically Organisms Modified in Mexico. Founding Member of the World Seawater Organization (OMAR) and Scientific Committee, based in Madrid, Spain and Antioquia, Colombia.

Functional medicine and the agronomic engineer: What it is and how to influence in a society after a pandemic

Food production in the world is one of the greatest challenges to achieve various purposes, among which is the supply of foods of plant origin, under the principle of sustainability, health, quality and agri-food safety. In the agri-food field, the main agent is the Agricultural Engineer, who is the professional with knowledge and technique in agri-food systems. However, the economic interests involved in producing food most of the time lead to the failure to meet sustainability criteria, resulting in the production of foods with high pesticide content and poisoning the population that consumes them. We can see this same phenomenon in conventional human medicine, where the pharmaceutical sector, together with human medicine professionals, has worn out; That is, instead of having those opportunities that it

gives you to connect with other individuals and do something for someone else, it has really and only been promoted more for economic interest and not the benefit of the patient. The alternative to this condition that is experienced in both sectors (agriculture and human medicine), is to carry out pesticide reduction in agriculture, getting as close as possible to sustainable and organic agriculture. For its part, in human medicine, it is of utmost importance to carry out in our lives the principles of functional medicine, which is the process where the professional truly integrates with the patient; It is one that does not focus on the disease, but focuses on the individual, in such a way that it does not cure diseases but rather creates health and that by redirecting the way we produce food and take care of our health, we will be able to give better meaning to our lives. A conference with the Global Scientific Guild, and where science meets wisdom. It is a conference enriched with the principles of Dr. Alexander Krouham, a global expert in functional medicine.

J. C. Tarafdar

ICAR-Central Arid Zone Research Institute, Jodhpur 342003, Rajasthan, India

Biography: Dr. J. C. Tarafdar did his M. Sc. and Ph. D. degrees in Soil Science and Agricultural Chemistry from Indian Agricultural Research Institute, New Delhi and Post Doctorate from Institute of Agricultural Chemistry, Goettingen, Germany. He has successfully developed biosynthesized nano-nutrients and nano-induced polysaccharide powder for agricultural use. Developed many new techniques now used in Soil Biology. Dr. Tarafdar published 405 research articles which include 48 book chapters, six books and four patents. He has >14000 citations with 56 h-index. He has been placed amongst the top 2% scientists, across all sciences in the world, by Stanford University, USA.

Mycoprotein nanoparticles for sustainable agricultural production

Nanoparticles (<100nm) made through microbial proteins to reduce respective precursor salts into eco-friendly nanomaterial's is a green alternative to chemical fertilizers for crop production and plant protection. It is a green synthesis process where bacteria, fungi or algae make use of their enzymes and biomolecules to reduce respective salts into nanoparticles either inside the cells by taking ions in, or outside the cell after tapping them on the cell surfaces where microbial proteins/polysaccharides acting as natural stabilizers. They often produced by metal ion capture followed by enzyme reduction, nucleation and growth and stabilization at near-room temperature with very eco-friendly and cost-effective synthesis method. They may absorb and enter through plant leaves or roots and fabricate variety of physiological, biochemical and molecular changes to plants resulted improvement in nutrient uptake and efficiency, increases tolerance to adverse environment and protect against pest and diseases. Large number experiments were conducted under field conditions throughout India with important cereals (maize, pearl millet, rice, wheat), legumes (clusterbean, gram, moth bean, mung bean), oilseeds (castor, groundnut, linseed, mustard) and vegetable crops (cabbage, cauliflower, potato, okra) with the microprotein nanoparticles under alluvial, arid, black and laterite soils. The results after two times foliar spray with the nanomaterial's represent 15-42% increase in cereal yield, 14-39% build-up of legume yield, 18-26% rise in oilseeds yield and 22-54% gain of vegetable yields over recommended doses of fertilizer. It also helps to increase soil carbon sequestration, beneficial enzyme activities and soil health index. It may assist to

overcome soil moisture stress, salinity, temperature stress and UV-radiation besides help in to prevent pathogenic, viral, insect and nematode attack. It shows no adverse effect of any plants with the recommended doses of application. The results clearly indicate microprotein synthesized nanoparticles may be the future for higher crop production under any adverse situation and to maintain soil sustainability.

Mary Cole

The University of Melbourne, Australia

Biography: Dr. Mary Cole studied at Monash University, Melbourne, Australia. She is an internationally recognised academic, plant pathologist and soil microbiologist for 45 years specializing in biological and regenerative agriculture farming emphasizing understanding of the role of soil biota in plant health. She demonstrates the damage synthetic chemicals have on soil and plant health. Mary supports farmers around the world in future-proofing their enterprises against climate change and ever-increasing cost of production.

Waste streams become resource streams in the circular economy

In a circular economy, waste streams must become resource streams because landfill is no longer an option in modern society even though these resource streams are increasing in volume with increasing population. The major industrial waste/resource streams in Victoria, Australia, are feedlot manure and urban FOGO–Food Organic-Green Organic. The Victorian Government has funded research into how these resources can be blended and how they impact both conventional synthetic input farmland and regenerative or input. No-till farmland. Furthermore, can these resources assist in farm land resilience in the light of climate change.

Mohammad Babadoost

Professor of Plant Pathology and Extension Specialist,
University of Illinois, United States

Biography: Mohammad Babadoost completed his Ph.D. in plant pathology at North Carolina State University. In 1999, he joined the faculty of the University of Illinois at Urbana-Champaign, where he is now a Professor of Plant Pathology and Extension Specialist. Mohammad conducts research and extension programs on the biology and management of vegetable and fruit crops diseases, and teaches Plant Disease Diagnosis and Management. In the past 25 years, Dr. Babadoost has been involved in various teaching, research, and extension programs in 43 countries and has developed a profound commitment to establishing food security in the world. He has more than 600 publications.

Diagnosing plant abnormality

Establishment of plants are affected by many biotic agents and abiotic disorders. Major biotic agents include pathogens, animal pests (insects and mites), and weeds. Major pathogen groups are fungi and oomycetes, prokaryotes (mostly bacteria), viruses and viroids, and nematodes. Abiotic disorders are caused by temperature, moisture, light, lack of oxygen, air pollution, nutrient (deficiency and excessive toxicity), soil pH, pesticides, and unsuitable cultural practices. My presentation will focus on diagnosing abnormalities of plants caused by pathogens and abiotic disorders that affect plant biology and stand establishment. Accurate diagnosing the incitant of plant abnormalities is the most important step for effective protection of plants. Symptoms and signs caused by the different groups of incitant of plant abnormalities will be discussed. Field and laboratory diagnosis of plant abnormalities will be presented. Using the classical methods and molecular tools for accurate identification of the causals of plant abnormalities will be explained. In the developed countries, plant clinics have been established for accurate diagnosing of plant abnormalities, while in most of the developing countries no plant clinics exist. More than 30% of plants and plant products in the developing countries are lost because accurate identification of the causal agents is not determined, so no effective practices for protection of plants against the causal agents are applicable. Attempts will be made to describe benefits of establishing plant clinics in

the developing countries, and how it can be easily set up. I will share my observations and experiences in more than 40 developed and developing countries for diagnosing plant abnormalities.

P E Rajasekharan

P E Rajasekharan, ICAR-IIHR, Hessaraghatta, Bengaluru 560089, India

Biography: Dr. P.E. Rajasekharan, former Principal Scientist at ICAR-IIHR, is a leading expert in biodiversity conservation, cryopreservation, and IPR, with over 35 years of service. He pioneered pollen cryopreservation in India, established a national pollen cryobank, and led major conservation missions for RET medicinal plants. His advisory work in Chhattisgarh supports MAP-based tribal livelihoods. With over 200 publications, three Springer-edited books, and training programs for scientists and industry, his impact spans research, policy, and education. A Fellow of ISPGR and IAAT, his work bridges science, sustainability, and innovation in plant genetic resource management and traditional knowledge protection.

Integrated approach to the exploration, collection, characterization, and conservation of RET medicinal plants in India

A network project on the ex situ conservation and sustainable utilization of Rare, Endangered, and Threatened (RET) medicinal plants has been operational since 2008, coordinated by ICAR-IIHR, Bengaluru, with nine collaborating centers across Southern and Northeastern India. This initiative focuses on 32 targeted species, including *Acorus calamus, Alpinia galanga, Celastrus paniculatus, Decalepis hamiltonii, Kaempferia galanga,* and *Oroxylum indicum*. Through 31 exploration missions across Kerala, Karnataka, and Tamil Nadu, a total of 374 accessions were collected and successfully established under Field Gene Bank (FGB) conditions for systematic evaluation.

Morphological characterization using species-specific descriptors revealed significant variability in floral, fruit, and seed traits among the accessions. Molecular characterization, a key objective, was conducted using ISSR markers. Previously reported data included *Celastrus paniculatus, Acorus calamus,* and *Oroxylum indicum*, while the current phase adds *Alpinia galanga, Kaempferia galanga,* and *Decalepis hamiltonii,* confirming considerable intra-species genetic diversity.

Chemical profiling, crucial for identifying elite chemotypes and ensuring authenticity, was undertaken for multiple species. New profiling methods were standardized for some species,

enhancing the potential to detect adulteration and optimize selection for multiplication and promotion. HPLC protocols were developed and used to authenticate plant samples.

A comprehensive database, redmed base, was established, integrating all morphological, molecular, and chemical data. Seed banks were set up for species propagated through seeds, with samples deposited in the National Gene Bank of NBPGR and IC numbers assigned. Protocols for *in-vitro* propagation and conservation were optimized for species like *Alpinia calcarata* and *Kaempferia galanga*. Preliminary studies in pollination biology and pollen viability were also undertaken. Seedlings and planting materials were distributed to collaborators and stakeholders, thereby supporting conservation, research, and outreach goals of the project. The details of these work will be presented.

Key words: RET Medicinal Plants, Exploration, Collection, Characterization and Conservation.

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Biography: Dr. P. E. Rajasekharan is a former Principal Scientist at ICAR-IIHR, Bengaluru, and currently an advisor to the CEO of the Chhattisgarh Medicinal Plants Board, has over 38 years of research experience in horticultural genetic resources, conservation, and IPR. A top ranker in M.Sc. (Botany) and ARS, he holds a Ph.D. from Bangalore University. Dr. Rajasekharan has published over 200 research papers, edited four volumes for Springer, and his achievements in pollen cryopreservation are globally recognized, with a record in the Limca Book of Records. He has received multiple fellowships and actively mentors students and professionals.

From rediscovery to recovery: Integrated ecological, biotechnological, and genetic strategies for conserving *Madhuca insignis*

Madhuca insignis (Sapotaceae), a critically endangered riparian tree species, was rediscovered in the Udupi District of Karnataka, India, after a 120-year hiatus. Despite subsequent sightings in fragmented pockets across Karnataka and Kerala, the species remains at extreme risk due to its isolated populations and precarious habitat. This study establishes a multidisciplinary framework to identify the causes of population decline and implement an integrated conservation strategy using biotechnological and ecological approaches. To address immediate survival, field explorations were conducted to assess habitat characteristics and anthropogenic threats, followed by the initiation of *ex-situ* conservation through plant tissue culture for mass propagation. Parallel investigations into associated endophytic fungi were performed to evaluate their contribution to host fitness, while regenerated plantlets were reintroduced into protected natural habitats to facilitate recovery. This was complemented by Ecological Niche Modelling (ENM) and spatial mapping, which not only identified high-probability conservation zones but also led to the discovery of two previously unreported populations. Finally, the study addressed genetic constraints using ITS markers to analyze gene flow and adaptive variation, alongside the development of RAPD-derived SCAR markers for precise molecular identification. Collectively, this research provides a comprehensive, science-based blueprint for the long-term recovery of *M. insignis* and similar threatened tropical taxa.

Keywords: Madhuca Insignis, Riparian, ENM Modelling, SCAR Marker, Reintroduction.

Rameshkumar K B

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Biography: Dr. Rameshkumar K. B. has more than 27 years of research experience in the field of Phytochemistry at KSCSTE-JNTBGRI, Kerala, India. He had several new molecules, new plant species, more than 70 research papers, produced 6 Ph.Ds, received awards including the prestigious 'Young Scientist' award by Govt. of Kerala and Fellowship by Kerala Academy of Sciences, and has an H index of 21. He had organised international conferences, workshops and training programmes in phytochemistry. He is currently working as Principal Scientist and HoD in the Phytochemistry Division of KSCSTE-JNTBGRI, and also the Scientist i/c of Central Instrumentation Facility-JNTBGRI.

Recent advances in phytochemical techniques

Mankind has been dependent on plants from time immemorial for his primary needs, and as civilization advanced, the application of plants and plant products extended to drugs, cosmetics, perfumes, dyes, pesticides, fuels, food supplements, nutraceuticals etc. The property of a plant depends on its chemical constituents, and the plant kingdom represents an extraordinary reservoir of molecules, synthesized from the fascinating laboratory of plants, and phytochemistry deals with these compounds. Scientific efforts so far have resulted in sorting around 2 lakhs natural products with 6,000 skeletons. The systematic approach to phytochemical research involves extraction of the plant material, separation and purification of the constituents and structure elucidation.

In the extraction process, the common organic solvents are slowly being replaced by more efficient solvents like super critical CO_2, and further solventless extraction techniques utilizing pressure, heat, filtration, and agitation to isolate desired compounds from plant material for specific applications are getting more popular. Solid Phase Micro Extraction (SPME) is an efficient solvent-free sample preparation technique where advancements in fibre coatings and hyphenations have created significant improvements in the extraction efficiencies. Advances in ambient analytical techniques such as Head Space (HS) analyses for volatile chemicals and Direct Analysis in Real Time mass spectrometry (DART) for non-volatile chemicals have eliminated the laborious sample preparation steps. The advancements in hyphenated analytical techniques such as LC-MS and GC-MS have saved the time and effort

significantly. Recently, the computational tools such as Artificial Intelligence and Machine Learning were incorporated to predict the spectra of complex phytochemicals and helps in processing the large quantity of spectroscopic data with respect to structural features, and has wide applications in plant metabolomics, chemical fingerprinting, chemical taxonomy, biosynthesis and phylogenetic studies, prediction of pharmacological and toxicological properties and virtual screening or *in silico* studies.

Overall, from the time consuming conventional wet-lab experiments, the phytochemists took the historical jump to instrumental analyses, and currently computer technology, especially Artificial Intelligence as well as Machine Learning, is bringing a paradigm shift in phytochemistry field as well. Imbibing the recent developments in various sectors of science and technology, phytochemists are now working in boarder areas with other subjects such as ecology, biotechnology, taxonomy, leading to groundbreaking discoveries, contributing significantly in unravel the secrets of nature.

Siti Nor Akmar Abdullah*, Mohammad Hafizuddin Halwi

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Biography: Dr. Siti Nor Akmar Abdullah, FASc. is a research fellow at the Institute of Plantation Studies in Universiti Putra Malaysia (UPM). She is a Professor of Plant Molecular Biology and a Fellow of the Academy of Sciences, Malaysia with more than 30 years of experience in plant molecular biotechnological research. Her contributions in her areas of expertise which are functional genomics, genetic engineering and molecular diagnostic tools for oil palm improvement and field management have received national and internationally recognition. She has published more than 120 research papers and has 10 granted patents.

Effective mitigation by *Pseudomonas aeruginosa* and a specialized organic fertilizer against early *Ganoderma boninense* infection in oil palm

Basal stem rot caused by *Ganoderma boninense* infection shortens the economic life span of oil palm trees resulting in major revenue loss to the oil palm industry in Malaysia. Control measures using organic fertilizer formulation and biocontrol agent could provide a long-term sustainable solution. However, information on the molecular mechanisms to guide effective application of these control strategies is lacking. This study aimed to compare these two control strategies on how they influence early-stage infection mechanisms of the fungal pathogen through ultrastructural, molecular, and physiological analyses. Oil palm seedlings were artificially inoculated with G. boninense and treated with *Pseudomonas aeruginosa* (T2) or anti-*Ganoderma* organic fertilizer (T3) and the roots were harvested at four different time points within three weeks post inoculation. While *G. boninense* inoculated but untreated seedlings served as positive control (T1). Severe cell wall degradation and fungal hyphae proliferation were observed in T1 through scanning and transmission electron microscopic analysis with T2 and T3 demonstrating much reduced damage. Superior cell wall protection was evident in T3. This finding was supported by DNA quantification which showed significantly lower pathogen DNA levels in T3. Gene expression profiling of selected defense response genes through RT-qPCR suggested that the endophytic bacteria, *Pseudomonas aeruginosa* activated ethylene/jasmonate defense signaling pathway earlier while the anti-*Ganoderma* fertilizer extended the biotrophic defense response. Furthermore, *EgGAMYB*

expression was enhanced under both treatments suggesting strengthening of cell wall structure. Ca^{2+}-signaling shift that promotes earlier, and more effective defense response was observed in T3. Physiological data on chlorophyll index and stomatal conductance supported much enhanced stability in T2 and T3 seedlings in contrast to the rapidly degrading T1. After 25 weeks, T1 showed necrotic roots and leaves, while T2 and T3 resembled healthy controls. Together the results of the study demonstrate the mitigation effects of both disease control strategies and how they differentially modulate biotrophic-to-necrotrophic defense phase transition in oil palm.

Keywords: Anti-*Ganoderma* Fertilizer, Electron Microscopy, *Ganoderma Boninense*, Gene Expression, Oil Palm, Plant Defense System, *Pseudomonas Aeruginosa.*

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Biography: Dr. Srinivasa Rao Mentreddy is an Indian-born American citizen and a Professor of Crop Science at Alabama A&M University in Alabama, USA. He earned his Bachelor's and Master's degrees in Agriculture from Andhra Pradesh Agricultural University in India and completed his Ph.D. in Agronomy at the University of Tasmania in Australia. His research focuses on developing cover crop-based sustainable crop production practices for vegetable and medicinal herbs in open-field and agroforestry systems; Evaluating low-temperature plasma to ensure food safety and improve crop productivity; And on climate-smart agricultural practices using cover crops and alley cropping. He has several years of research experience in variety evaluation, using crop growth, radiation use efficiency, and competitive ability across a wide range of field crops. Dr. Mentreddy introduced pigeon pea, mungbean, turmeric, Virginia mountain mint, and medicinal basil for cultivation in Alabama. Dr. Mentreddy teaches agricultural science courses at the undergraduate and graduate levels and serves as a reviewer and member of editorial committees for numerous journals.

Developing Virginia mountain mint (*Pycnanthemum virginianum*): As a commercial crop in *Alabama*, USA

Virginia mountain mint (*Pycnanthemum virginianum*), a mint-flavored herb with diverse aroma profiles and high essential oil content, offers the potential for culinary, confectionary, and medicinal applications. The genus is native to North America, and the Southeastern United States is considered the center of diversity. North Alabama has conducive weather conditions for the commercial production of mountain mint, provided suitable varieties and cultivation techniques are developed. The objective of this research was to assess adaptability, above-ground biomass production, essential oil content, and its composition of four Virginia mountain mint varieties over two years in north Alabama. Thirty-day-old greenhouse-grown seedlings of four varieties (M1, M2, M3, and M4) were planted in field plots in Year 1.

In Year 1, total fresh above-ground biomass ranged from 125g per plant (M4) to 809g (M3), with M1 and M2 producing 699 g and 561 g. In Year 2, fresh above-ground biomass increased by 82% for M1, 66.5% for M2, 21.9% for M3, and 226.9% for M4. Mountain mint regrowth in Year 2 consistently increased over Year 1. At the first harvest in Year 1, the EO content of M1

was 1.15%, higher than M2 (0.91%), M3 (0.76%), and M4 (1.03%). At first harvest in Year 2, the EO content of M1 and M3 increased to 4.91% and 1.85%, respectively. The EO content of M2 and M4 decreased to 0.53% and 0.79% respectively. In Year 1, isomenthone concentrations in M1 increased significantly throughout the season, from 19.93% at H1 to 69.31% at H3. In M3, isomenthone rose from 18.1% at H1 to 65.83% at H3. However, it increased only slightly in M2 and M4. Thymol concentration decreased slightly but not significantly across all four varieties. Thymol levels in M2 and M4 were much higher than in M1 and M3. In year 2, M1 and M3 had higher levels of isomenthone (31 & 21%, respectively), whereas M2 & M4 had the highest levels of thymol (33 and 71%, respectively). Varieties M1 and M3, with higher EO content and greater plant and leaf biomass, were the best-performing varieties. The study showed mountain mint offers potential for production in North Alabama. Farmers can maximize yield and minimize production costs by growing the crop over multiple seasons.

Susmita Shukla

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Biography: Dr. Shukla is PhD and M.Sc in Biotechnology and more than 23 years of teaching and research experience. She is currently working as Professor in Amity Institute of Biotechnology, Amity University Noida, UP, India. She has received prestigious award as DBT travel grant for presenting research work in International conference at Singapore, IASc-INSA-NASI Summer Research Fellowship Award, Career Advancement Award from DBT, Best Young Scientist Award and Scientist of the Year Award for presenting research work presented in an International conference. She has run successfully 4 Minor Projects and two projects sanctioned by DBT (Department of Biotechnology, Govt. of India) under Bio-CARe scheme and DBT Twinning. She has published research papers in reputed National and International journals. She presented her research work in National and International conference. She has also filed and granted patent of commercial use. Organized National & International seminars and four Indo- African Training Program for African Professionals.

Growing green futures: Plant tissue culture, micropropagation, and bioplastics for sustainable horticulture

Modern horticulture is undergoing a profound transformation as agriculture faces unprecedented challenges arising from climate change, land degradation, shrinking natural resources, and the growing demand for high-quality planting material. In this context, micropropagation—an advanced plant tissue culture technique—has emerged as a powerful catalyst for sustainable agriculture by enabling rapid, large-scale, and year-round production of uniform, disease-free, and elite planting material. The Keynote speech will highlight the pivotal role of micropropagation in reshaping modern horticultural practices while supporting the principles of sustainability, resilience, and circular bioeconomy.

Micropropagation offers a reliable solution to the limitations of conventional propagation methods, which are often constrained by seasonality, low multiplication rates, and the risk of pathogen transmission. Through *in-vitro* culture of explants under controlled conditions, micropropagation ensures genetic uniformity, high multiplication efficiency, and accelerated plant.

The keynote further explores the integration of plant biotechnology with sustainability-driven innovations, particularly the development of plant-based bioplastics. There is huge potential of tissue culture-derived biomass and plant resources for biodegradable and eco-friendly alternatives to conventional plastics, especially for horticultural applications such as nursery containers, mulching materials, and packaging.

Together there is interlinked relationship between micropropagation, sustainable horticulture, and bioplastics towards circular bioeconomy. This keynote speech will provide insights into future research directions, technological advancements, and industry–academia collaborations. The discussion highlights plant biotechnology innovations with global sustainability goals, their relevance in achieving food security, environmental conservation, and sustainable development.

Valasia Iakovoglou

Geomorphology, Edaphology and Riparian Areas Laboratory (GERi Lab), Democritus University of Thrace, Drama, Greece

Biography: Dr. Valasia Iakovoglou is a distinct graduate of Iowa State University, USA. She has more than 25-yrs of national/international research and teaching experience as an Ecophysiologist/Silviculture expert in seedling production and Restoration/Conservation of Ecosystems with emphasis on Biodiversity under the challenges of Climate Change. She has received numerous scholarships, awards and recognitions. She is an editor of more than ten international journals and a reviewer in more than fifteen, as well as a reviewer at the Intergovernmental Panel on Climate Change (IPCC). She has more than 100 publications (books/book chapters, peer-reviewed scientific articles) and more than 20 international projects. She is active in many scientific societies such as the Mediterranean Experts of Climate and environmental Change (MedECC) and the International Network of Bioresource Management (INBM). She holds leading positions such as: Director of Ecotourism Sector of the UNESCO chair Con-E-Ect; Executive Board of Directors of Climate Smart Agriculture Youth Network Global (GCSAYN) in Africa; General Secretary of associations such as the Association of Inter-Balkan Woman's Cooperation Societies (AIWCS) of UNESCO Center for the peace in the Balkan area; International Council of World Tourism Forum Institute; Country Chair of Greece of the G100 Women of the World serving as for Farming and AgriTourism

FEED4FOOD: Living Labs (LLs) aiming for urban food security

The FEED4FOOD project advances a transformative model for urban food security by establishing and enhancing Living Labs (LLs) across diverse socio economic and environmental contexts in three countries that are Greece (Drama), Cyprus (Strovolos) and Romania (Bucharest). Central to the initiative is the empowerment of minority groups (e.g. women) via their participation in community driven urban gardening. The project leverages LLs as experimental, inclusive environments where innovative cultivation techniques, social engagement and sustainable practices converge to strengthen urban food systems. A key illustration of FEED4FOOD's approach for Greece is the Drama LL, which spans 12 acres and includes 80 individual gardens of approximately 100–110 m^2. Targeting vulnerable groups that include women, migrants and dropped out youth, the LL focuses on profitable and low input vegetable cultivation, water use monitoring, organic production, waste reuse strategies, and market linkages with local distributors. Complementary objectives include capacity building, knowledge transfer and hands on training for sustainable urban gardening. Ultimately,

FEED4FOOD's Living Labs foster resilient, inclusive and environmentally sound urban food systems that strengthen long term food security in rapidly urbanizing regions.

Keywords: Biodiversity, Conservation, Minority Groups, Sustainability, Urban Gardening.

Dr. Vijayan Gurumurthy Iyer Ph.D, PDF Elab, D.Sc, LL.D, DL

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Biography: Dr. Vijayan Gurumurthy Iyer studied Environmental Science and Engineering at the Indian School of Mines, Dhanbad and graduated as M.Tech. in 1998. He has served in Indian Council of Agricultural Research (I.C.A.R.) during 1985-1998 as Technical Officer. He received his PhD degree in 2003 at the same institution. After ten-years postdoctoral fellowship supervised by Dr Nikos Mastorakis in WSEAS, Greece, he obtained the position of a Professor in Haramaya University, Ethiopia., Served as a faculty in Bihar Institute of Public Administration & Rural Development (BIPARD), Gaya, Bihar, India. Presently serving as a consultant in Dr. Vijayan Gurumurthy Iyer Techno-Economic-Environmental Study and Check Consultancy Services Avadi, Chennai, India. He has published more than 450 research articles in journals and more than 5000 research citation. His h. index 60.

Environmental Health Impact Assessment (EHIA) process for tobacco processing plants

The health impacts of projects, plans, programs, policies, or legislative actions should be considered in the decision-making process. Because of these concerns, an Environmental Health Impact Assessment (EHIA) process is proposed for tobacco processing plants in India. Tobacco is responsible for nearly six million deaths each year and is expected to rise eight million by 2030 globally (World Health Organization, 2025). The environmental health effects of tobacco are stained teeth and bad breath, brain cell domine health effects because of dissolved oxygen depletion levels and anxiety and depression mood swings, nicotine exposure change in brain damages and DNA and RNA as carcinogenic substance beyond 2ppm, oral, lung and stomach oesophageal cancer. Environmental public health can be defined as the environmental science and art of preventing environmental health disease, prolonging life and improving quality of life through organized efforts and informed choices of society, organizations (public and private), communities and individuals. It is necessary to address psychological impacts on nearby residents as damage mental health. Environmental public health work is achieved by promoting healthy lifestyles, research and development on environmental health disease and injury prevention, and detecting, preventing and responding to infectious oral, esophageal and stomach cancerous mutagenic diseases

(Vijayan Gurumurthy Iyer, 2019). The most of the significant terms are environmental health inventory, Environmental Health Impact Assessment (EHIA) and environmental health impact statement. Environmental public health deals with the control of water and air pollution, soil-hazardous waste management, resource protection, and soil and ground water remediation. The significant legislative action is EHIA process and Environmental Quality (EQ) that included for the physical-chemical, biological, (natural or biophysical environment) and cultural, and socioeconomic environments (nan-made environment). Environmental Health Impact Assessment (EHIA) process for tobacco public health plants and Psychological Impact Assessment (PIA) process is discussed.

10TH EDITION OF

Global Congress on

PLANT BIOLOGY & BIOTECHNOLOGY

HYBRID EVENT

26-28 MARCH 2026

ORAL PRESENTATIONS

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Smallholder farmers adaptive and extent of response strategies to climate change variability impacts in KwaZulu-Natal province of South Africa

Smallholder farmers in KwaZulu-Natal province confront an increasingly erratic climate marked by unpredictable rains, extended dry spells, and rising temperatures, all of which jeopardise their predominantly rain-fed cropping and livestock systems. This study surveyed 240 farmers across two ecologically diverse districts—Amajuba and Thukela—to quantify both the range of adaptation strategies employed and the intensity of their use. Using a Composite Index of Adaptation strategies (CIA), farmers' engagement with 13 climate-smart practices was scored and classified into low, moderate, and high adaptation levels. Results reveal that while nearly all farmers utilize rainwater harvesting and improved seed varieties, and over 75% practice soil and water conservation or precision techniques, critical measures such as agroforestry and integrated crop-livestock management are largely neglected. The CIA classification placed 74% of respondents in the moderate category, indicating partial uptake of available strategies, whereas only 9% reached high adaptation—demonstrating comprehensive, coordinated response. Socio-economic analysis shows that education, extension contact, and credit access strongly correlate with higher adaptation scores, while extremes of age and gender disparities persist. These findings highlight the uneven resilience landscape within the smallholder community and underscore the need for tailored interventions. Policymakers and development partners should prioritise capacity building, financial inclusion, and community-driven approaches to bridge existing gaps. By aligning support with farmers' specific capacities and constraints, it is possible to scale proven practices, foster innovation adoption, and build a more resilient agricultural sector capable of withstanding the mounting challenges of climate variability.

Biography

Abbyssinia Mushunje is a professor and former Head of Department of Agricultural Economics & Extension at the University of Fort Hare, South Africa. To date he has graduated 41 Masters and 33 Doctorate students. Abbyssinia has published over 120 peer reviewed research papers in local and international journals plus seven book chapters. He has presented over 30 conference papers, locally and internationally. Abbyssinia has been invited as a guest speaker to seven international conferences. His areas of research interest include land reform, climate change, farm efficiency, technology adoption, food security and rural livelihoods. He is a member of the Agricultural Economics Association of South Africa, AAAE and IAAE.

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In-vitro propagation of grapevine shoots and its molecular analysis

Preserving genetic similarity is one of the key points to enhance resilience, functionality, and unique adaptation. Micropropagation is the most reliable approach to preserve genetic similarity. In this work, we compared the efficiencies of the three modified growth culture media–Murashige and Skoog (MS), Woody Plant Medium (WPM), and Driver-Kuniyuki Wallnut (DKW) on shooting number and length. The efficiency of BAP, kinetin, and *meta*-topolin in the above culture media has been established for four local Uzbek grape (*Vitis vinifera L.*) cultivars. MS was found to be the most efficient culture media among the studied ones to grow Odqum kishmish, Rizamat, Toyfi, Sugdiyona kishmish grape cultivars, belonging to highly productive ones in Uzbekistan. In this work, we compared the effects of MS_1, WPM_1, and DKW_1 nutrient media (not holding *m*T) with MS_2, WPM_2, and DKW_2 nutrients containing mT. In MS_2, WPM_2, and DKW_2 media, there was a significant increase in shoot number and length.

The shoot number of Oqdum kishmish and Rizamat cultivars were compared in media containing *m*T (MS_2) and without (MS_1). Explants grown in MS1 nutrient media had 5, 6 buds, while explants grown in MS_2 nutrient media had an average increase of 8, 10 buds.

Compared to MS1 (A_1) medium, MS2 (A_2) nutrient medium showed a reduction in the day of shooting of Oqdum kishmish and Rizamat cultivars. No significant difference was found in the shooting days of Toyfi and Sugdiyona kishmish cultivars. Significant differences were observed in the shoot number and length of two cultivars grown in the A_2 media. Greater difference belonged to Oqdum kishmish over Rizamat. There were no significant differences in the number of shoots of Toyfi and Sugdiyona kishmish cultivars grown in the A_1 and A_2 samples; The difference was found only in the shoot length. Among the four cultivars, Oqdum kishmish was the best indicator. The average number of shoots was 8–9, and the length increased by 5–6cm. The research results show that growing plants in artificial nutrient media does not always ensure normal growth; It depends on the genotype of the plants as well.

Explants grown in WPM_1 (B_1) and WPM2 (B_2) media under the influence of 0.5mg L^{-1} *m*T showed a difference in shoot number in Oqdum kishmish cultivar. A clear difference in the shoot length was shown in Toyfi cultivar. In Rizamat cultivar, the number of shoots increased in those grown

in B_2 media. In the Sugdiyona kishmish cultivar, the shoot number and length increased in B_2, which is attributed to *m*T. Under the influence of *m*T, the number of shoots of all cultivars increased. Different growth of the reign length is a process depending on the genotype of the plants.

In this work, we established that BAP, Kin, and mT in 1.0: 0.5: 0.5mgL^{-1} doses significantly increased the number and length of shoots of four cultivars of *Vitis vinifera*. We found that growth regulators increased and prolonged the number of shoots. (SSR) microsatellite markers were used to compare the obtained explants with the mother plant in order to determine the purity of the cultivar and genetic variability. As a result, it was found that the explants are genetically similar to the mother plant. The modified MS2 nutrient medium was found to be the most effective nutrient for the studied grape cultivars.

Biography

Adkham N. Abdullaev graduated from the Agricultural University in 2014-2018 with a bachelor's degree in Plant Protection and Quarantine. From 2018 to 2020, he completed a master's degree in agrobiotechnology with honors. From 2020 to 2024, he worked as a junior research associate in the transgenomics and tissue culture laboratory of the Center for Genomics and Bioinformatics, and is currently a doctoral student at the center.

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High-altitude, market-driven iceberg lettuce supply chain model for QSRs: A case of Meta Crop Agri Pvt Ltd, India

Year-round availability of exotic salad vegetables, particularly iceberg lettuce, is a critical prerequisite for the uninterrupted operations of multinational Quick Service Restaurant (QSR) chains such as McDonald's, Burger King, and Subway in emerging markets like India. These global brands depend on reliable, compliant supply chains that can deliver consistent quality and volume under highly variable agro-climatic conditions. In this context, Meta Crop Agri Pvt Ltd has developed a market-driven production and supply chain model for iceberg lettuce, targeting the lean supply periods of hot summer and monsoon seasons. The company strategically leverages high-altitude production pockets in Ladakh, where naturally cool temperatures and low pest pressure allow successful cultivation of temperate lettuce with reduced dependence on energy-intensive climate control.

The production system is aligned with stringent buyer protocols, including adherence to good agricultural practices, on-farm quality assurance, and traceability from field to fork. Harvested heads are rapidly pre-cooled and moved into an integrated cold chain for long-distance transport to a centrally located packhouse in the plains of India. At the packhouse, a structured post-harvest management protocol is followed, encompassing grading, trimming, sorting, shredding, and multistage hygienic washing designed to meet QSR food safety requirements. Subsequently, the product is packed in Modified Atmosphere Packaging (MAP) bags, which help maintain turgidity, colour, and sensory quality during refrigerated distribution and retail-level storage.

The cold chain is extended seamlessly from high-altitude farms to QSR outlets through temperature-controlled logistics, thereby minimizing physiological losses and quality deterioration over long distances. Meta Crop Agri's model demonstrates how spatial diversification of production regions, combined with robust post-harvest and cold chain infrastructure, can effectively de-risk supply during agro-climatic stress periods while meeting strict qualitative and quantitative specifications of multinational buyers. The approach also illustrates a scalable backward linkage framework that integrates small and medium growers in niche agro-ecologies into high-value, contract-driven vegetable supply chains.

By aligning cropping calendars with demand forecasts and by using natural high-altitude advantages in Ladakh to complement traditional winter production zones, the company contributes to supply chain resilience, risk mitigation, and reduced import dependence for specialized salad vegetables. The case underlines the potential of private agri-enterprises to design climate-smart, resource-efficient, and market-responsive horticulture models that support both corporate procurement needs and rural livelihood enhancement in fragile mountain ecosystems.

Biography

Dr. Akhilesh Kumar is a seasoned biotechnologist turned agricultural entrepreneur, driven by a passion to empower farmers and revolutionize horticulture practices in India. With a robust foundation built over 20 years in cutting-edge research, Dr. Kumar seamlessly transitioned from the laboratory to the field, translating scientific advancements for the agricultural community. His academic journey accomplished with PhD from Jadavpur University, Kolkata, with research conducted at the Indian Institute of Chemical Biology. This was followed by significant contributions at the National Research Centre on Plant Biotechnology at IARI Pusa, New Delhi, and a prestigious postdoctoral scholarship at Volcani Center in Israel.

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Genetic variability analysis in maize (*Zea mays L.*) materials for drought tolerance using miRNA molecular markers

Maize (*Zea mays L.*) is one of the staple grains of great global importance, and in Guatemala, it constitutes the pillar of the nutritional and food security of its inhabitants (Martinez, 2022). The national production does not cover the internal demand, which is why this cereal must be imported. Drought is a significant factor in this issue, especially in the geographical area known as the Dry Corridor, which has economic impacts on Guatemala (Fuentes López, 2002) (ICTA, 2019) (Morales, 2018).

The general objective of this research was to analyze the molecular genetic variability of 90 maize accessions for drought tolerance; These materials were collected in the Dry Corridor region of Guatemala. A genetic profiling assay was conducted with five miRNA molecular markers, from which six nodes and four individual accessions of the total dendrogram were derived. This showed genetic variability, highlighting 13 representative accessions from the collapsed nodes and the four independent accessions. Subsequently, the individual study of each miRNA molecular marker with the 13 preselected accessions was carried out, which allowed for the observation of possible markers associated with drought tolerance. The association of the resulting data from the molecular study and the field evaluation showed similarity in the preliminary selection of lines associated with drought tolerance, particularly lines 7, 12, 14, 28, and 46.

Keywords: microRNA, Drought, Genetic Tolerance, Accessions.

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The floral headspace volatiles of selected orchids

Floral headspace volatiles are a mixture of Plant Volatile Organic Compounds (PVOCs) emitted from the flowers into the surrounding atmosphere. Based on the biosynthesis, floral HS volatiles are grouped mainly into terpenoids, phenylpropanoids and fatty acid derivatives.

Floral HS volatiles mediate ecological interactions with microbes, pollinators, insects and herbivores, and significantly contribute to the atmospheric chemistry. In addition, floral volatiles are widely used as components of perfumes, cosmetics, flavorings, and also in therapeutic applications. However, most of the flowers are yet to be investigated for their floral HS volatiles. Orchids are one of the largest groups of flowering plants with extraordinary floral diversification and adaptation strategies especially with regard to the shape, color and fragrance. Along with the intriguing shapes and stunning colours, the fragrance is key determinant in orchid industry. The current study focuses on the floral headspace profiles of the orchids *Dendrobium crumenatum* (Pigeon orchid), *Grammotiphyllum speciosum* (Tiger orchid), *Oncidium Jamie Sutton x Honolulu* (Dancing girl) and *Peristeria elata Hook.* (Dove orchid). The HS volatiles were analysed using Shimadzu GC-MS with Headspace Sampler (HS-20) using static headspace method. The volatile compounds were identified by calculating the RRI value, interpreting the mass spectrum, and through library search. The major floral HS volatiles identified are; *Dendrobium crumenatum* (Pigeon orchid)- β-ocimene, benzaldehyde, methyl benzoate, benzene acetaldehyde and nerolidol; *Grammotiphyllum speciosum* (Tiger orchid)-E-β-ocimene, β-caryophyllene, linalool, (E, E)-α farnesene and δ-cadinene; *Oncidium Jamie Sutton x Honolulu* (Dancing girl)-1, 8-cineole, α-pinene, linalool, benzaldehyde and β-myrcene and *Peristeria elata* Hook. (Dove orchid)-1,8-cineole, α-pinene, 2-phenyl ethyl acetate, myrcene and limonene. The reported floral HS volatile have significant role in ecological, medicinal, chemotaxonomical, and horticultural applications.

Biography

Dr. Cinthya Christopher serves as Associate Professor and Head of the Department of Botany at All Saints' College, Thiruvananthapuram, Kerala, India. She holds Ph.D. degree in Botany from the University of Kerala, and qualified CSIR UGC NET. With over twenty-five years of teaching experience, she has made significant contributions to botanical education and research. Dr. Christopher is currently guiding five Ph.D. scholars working on intraspecific variants of medicinal plants. She has published over 25 research papers in peer-reviewed journals and contributed chapters to six books on plant conservation and sustainability. Her work has earned prestigious recognitions including the Best Faculty in Botany Award (2023), Dr. Vijayavalli Young Scientist Award (2019), and the Inspiring Green Mentor Award (2019). As a resource person, she has delivered lectures and workshops on terrarium techniques, plant taxonomy, and environmental conservation, and has organized numerous national and international seminars. Dr. Christopher also serves as a reviewer for multiple international journals in plant sciences.

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Fusarium spp. as soilborne pathogens in black pepper plantations in the Central Highlands in Vietnam and a sustainable remedy to control the problem

Vietnam is the largest producer of black pepper (*Piper nigrum L.*) worldwide. Unfortunately, this has been achieved through intensive management of both land and crops for over thirty years, which has led to deterioration of soil health and increased the incidence of soilborne pests and diseases. For many years, oomycetes, including *Phytophthora* spp., *Pythium* spp., and *Phytopythium* spp., together with nematodes, have been considered the main infectious agents. However, our recent findings indicate that the fungi *Fusarium* spp. significantly contribute to the diseases associated with black pepper. We sampled soils and black pepper

roots from highly infected plantations in the Central Highlands of Vietnam and isolated 300 fungi from these samples. Among them, 23 isolates of *Fusarium* spp. showed pathogenicity after testing in the greenhouse. Bioinoculants were tested as an alternative to pesticides in field trials implemented on infected farms. Promising results showed that the application of bioinoculants could significantly reduce the population of these pathogens and contribute to the restoration of soil health in the Central Highlands of Vietnam.

Biography

Duy Quang Nguyen is a lecturer at the Faculty of Chemical and Food Technology, Ho Chi Minh City University of Technology and Engineering (HCM-UTE), Vietnam, and a PhD candidate at School of Life and Environmental Sciences, Faculty of Science, Engineering and Built Environment, Deakin University, Australia. His focus for PhD project is on the soilborne pests and diseases affecting black pepper plantations in the Central Highlands in Vietnam and sustainable remedies to control the problem. This research work was done at the Common Platform on Soil Health of the Asia-Pacific network CMBP, hosted by The Alliance of Bioversity and CIAT in Ha Noi, Vietnam.

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Dissecting the polygenic basis of PSA resistance in tetraploid kiwifruit

Bacterial canker, caused by *Pseudomonas Syringae pv. Actinidiae* (PSA), has been one of the most destructive diseases affecting kiwifruit (*Actinidia* spp.) worldwide for over a decade. Despite ongoing breeding efforts, no fully resistant cultivars have yet been released, and disease management still relies mainly on preventive strategies and the cultivation of less susceptible genotypes. Nevertheless, some *Actinidia* species, particularly *A. arguta,* exhibit notable tolerance to the pathogen, making them valuable genetic resources for resistance breeding.

To dissect the genetic basis of Psa resistance, an interspecific tetraploid population derived from a cross between *A. chinensis* var. *chinensis* (susceptible) and *A. arguta* (tolerant) was evaluated under controlled infection conditions. Cane inoculations were performed, and lesion development was monitored for six weeks. Disease severity was quantified by measuring lesion length and infection rate. Genotyping was carried out using ddRAD sequencing, allowing the construction of a high-resolution interspecific linkage map. QTL analysis revealed several loci associated with resistance on chromosomes 4, 17, and 28, with the region on chromosome 28 showing a stronger effect on the resistance phenotype. A susceptibility-related QTL was also identified on chromosome 9.

In parallel, RNA-seq analysis of infected subcortical tissues from both parental genotypes uncovered differentially expressed genes associated with resistance and susceptibility responses. Together, these findings shed light on the polygenic nature of Psa resistance in kiwifruit and provide a genomic framework for developing resistant cultivars through marker-assisted selection.

Biography

Gloria De Mori is a researcher at the department of agricultural, food, environmental and animal sciences (DI4A) at the University of Udine and a member of the tree crops research group. After completing a bachelor's in biotechnology and a master's in plant and animal biotechnology, she earned a PhD focusing on the genomic region controlling sharka resistance in apricot. Her postdoctoral work centered on *Actinidia*, including developing molecular markers for early sex discrimination, optimizing transformation protocols for hermaphrodite plants, and mapping resistance to Psa. She have also mapped genomic regions linked to downy mildew resistance in grapevine and currently work on *Actinidia* improvement projects.

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In-vitro multiplication efficiency of *Aronia melanocarpa* 'Alexandrina' with meta-topolin

Aronia Melanocarpa (Michx.), commonly known as black chokeberry, is a woody shrub belonging to the Rosaceae family, and originating from North America. It is cultivated in temperate areas for its small, dark berries, which are rich in antioxidants, including flavonoids and phenolic acids. The fruits are mainly intended for processing and less commonly consumed fresh, due to their pronounced astringent taste and bitter-almond smell. However, the interest in this fruit species has increased, as numerous studies have shown that they have potential health benefits. In vitro tissue culture techniques play and important role in the propagation this woody species, as they enable the production of disease-free and genetically uniform planting material. The present study aimed to evaluate the in vitro response of 'Alexandrina', a Moldavian cultivar, to different types of plant growth regulators. The initial plant material was obtained as in vitro cultures, from the National Botanical Garden (Institut) "Alexandru Ciubotaru" of the State University of Moldova and was subsequently multiplied in vitro at the University of Agronomic Sciences and Veterinary Medicine of Bucharest, Romania. In vitro multiplication of Aronia melanocarpa 'Alexandrina' was performed out on Murashige and Skoog (MS) medium, supplemented with five different cytokinins, each at a concentration of 4µM: meta–Topolin (mT), Zeatin (Z), kinetin (kin), 6-(γ, γ-Dimethylallylamino) Purine (2iP) and Thidiazuron (TDZ). All media variants also contained 2.9µM Indole-3-Acetic Acid (IAA) and 0.58µM Gibberellic Acid (GA3). The results showed that meta-topolin significantly enhanced the multiplication rate of A. melanocarpa explants, resulting in the highest average number of shoots (21.5 shoots/explant) and biomass accumulation (1.9455 g fresh weight/explant). By comparision, the other media variants produced fewer shoots/explant: 1 shoot on medium with KIN, 1.8 shoots on 2iP and 4.5 shoots on Z. Explants grown on medium with KIN, even although showing limited proliferation,

exhibited the greatest shoot elongation (44.94mm), leaf development and rooting (100%), with an average of 3.1 roots/explant and 79.47mm average length. A similar response was observed on medium with 2iP, with an average shoot length of 39.29mm and 3.3 roots/shoot with a mean length of 49.98 mm. The inclusion of TDZ resulted in the formation of compact, globular masses of shoots (2.3258g fresh weight/explant) that were small, highly friable, and hyperhydrated rendering them unsuitable for further multiplication. For rooting, shoots obtained on media with meta-topolin were cultivated on half-strength MS medium with 1g/L activated charcoal, supplied either with Indole-3-Acetic Acid (IAA) or Indole-3-Butyric Acid (IBA). Copper sulphate ($CuSO_4 \cdot 5H_2O$) concentration was increased to 0.125mg/L to enhance root growth and plantlet development. All media variants promoted rhizogenesis and shoot growth, and the plantlets were succesfully acclimatized. In conclusion, the results demonstrate that meta-topolin is a highly effective cytokinin for the in vitro multiplication of Aronia melanocarpa 'Alexandrina', while kinetin and 6-(γ, γ-Dimethylallylamino) purine are more suitable for shoot elongation and rooting. The optimized protocol provides an efficient approach for the rapid multiplication of this species and may support large-scale production for horticultural and pharmaceutical applications.

Biography

Ioana-Catalina Nicolae is a researcher in the Plant Micropropagation Laboratory within the Research Center for Studies of Food Quality and Agricultural Products at the University of Agronomic Sciences and Veterinary Medicine of Bucharest, Romania. After completing her bachelor's in horticultural engineering and a master's in Biodiversity Management and Conservation, she finished her PhD that focused on the use of synthetic seed technology in the conservation of Fragaria x ananassa and Solanum tuberosum. Her research centers on the development of in vitro propagation protocols for horticultural crops, with a particular emphasis on fruit species.

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Molecular mechanisms of plant stress induced by toxic heavy metals

Climate change and environmental pollution create stress in plants, which is directly linked to loss of biodiversity, food security, and human health. Tropical regions are special vulnerable areas due to the intense use of natural resources and the narrow tolerance of living species to temperature changes, and to other abiotic effects. Heavy metals pollution is a worldwide problem that has deteriorated environment and has placed health of many countries at risk. Toxic heavy metals represent a challenge, since metals in their elemental state cannot be decomposed further. In spite the well-known toxicity of metals like Cd, Pb, Hg, and As, and furthermore their capacity to induce several diseases, such as cancer, important details of the mechanism of action in animal and plant cells are not known. The most frequent means of entry in our body is through water and crops contaminated with heavy metals. This work concentrates on intracellular and molecular events associated with heavy metals mobilization and toxicity in plants. Damages to critical plant cell organelles are observed when concentration of toxic heavy metals exceeds the capability of physiological detoxification systems. Possible roles and impact on cell cytoskeleton are discussed.

Molecular components of the actin cytoskeleton seem to respond to the toxic effects of metals. Alternatives to clean contaminated soil and water resources are tedious, not very effective and highly expensive. This would be the case of phytoremediation, where limitations exist, due in part to the lack of understanding of the mechanism involved in the mechanism of metal accumulation in plants. In this work, phytoremediation alternatives using tropical plants are examined. In general, this study uses molecular genetics, and biochemical studies to elucidate the homeostasis of heavy metals in plants.

Biography

Dr. Juan A. Negrón-Berríos is a biochemist and academic leader with research interest in heavy metal homeostasis across plant and animal cells, use of biotechnological tools to create a sustainable agriculture, and plant stress responses to pollution and climate change. As Chancellor of Inter American University of Puerto Rico's Barranquitas Campus and former Dean of Academic Affairs, he has maintained interdisciplinary research and institutional innovation, securing multiple grants for scientific and educational advancement. He founded the Institute of Sustainable Biotechnology, driving biotechnology applications for environmental, agricultural, and health issues in Puerto Rico.

K. R. Aneja

Former Professor and Chairman, Department of Microbiology, Kurukshetra University, Kurukshetra -136119 (Haryana), India

Biological control of weeds: Strategies, current status and future prospects of mycoherbicides

Weeds, the plants growing rapidly where not desired, are a major kind of pests. Weeds constitute 3 % of the total 3,50,386 species of plants identified worldwide. They are troublesome and a major threat to human health, biodiversity, and agricultural productivity. Annually, they cause billions of US dollars of damage. It is estimated that they can reduce crop yields by as much as 12% which results to US $32 billion as a whole. Management of weeds by herbicides account for over US $14 billion every year. Controlling weeds through herbicides/ weedicides is not an ideal option in organic cropping system since they cause significant damage to the environment by polluting/ contaminating air, soil and water, thereby posing severe health risks to humans (cancer, neurological disorders), reducing biodiversity and soil microbiota (essential in biomass cycling, increasing soil fertility), and creating superweeds.

Control of agricultural and forest weeds using foliar pathogens has gained acceptance as a safe and environmentally sound approach. The microbe- based formulations used to control weeds are termed as microbial herbicides/bioherbicides. Based upon the microbial control agent used in a formulation, the bioherbicides are classified as: Mycoherbicides (fungi), bacterial herbicides (bacteria) and virus herbicides (viruses).

Biological weed control using fungal phytopathogens is carried out by three strategies: Classical, mycoherbicidal and manipulated mycoherbicide strategy. Mycoherbicidal strategy involves the usage of host-specific, indigenous, virulent fungal plant pathogens, which are mass produced and sprayed in the fields, the way chemical herbicides are used, to control specific weeds without harming to the crop and other non-target hosts in the environment. Globally 26 bioherbicides have been developed so far. The pace of their adoption by the

users (farmers, foresters, horticulturists) is, however, slow because of an array of biological, economic and regulatory constraints. The future of bioherbicides appears to be promising. The need of the hour is working of plant pathologists, weed scientists, and biotechnologists, in collaboration with industrial houses to resolve the issues in their production and successful application in fields to control weeds within short time comparable to chemical herbicides.

Biography

Prof. K. R. Aneja is the recipients of many Awards and Fellowships, the major one's are President of the Mycological Society of India, 2022 Lifetime Achievement Award, Recorder of ISCA, INSA-Royal Society Academic Exchange Fellowship, Best Citizens of India, Rashtriya Gaurav, ISWA lecture award, Shiksha Rattan Samman, and 2023 Unnat Bharat Shewa Shree Award. He served as the Governor's/Chancellor's nominee for Teacher's selection at Punjabi university, Patiala, a Member of the Research Advisory Committee of ICAR Weed Research Centre, Jabalpur, M.P, India and an Expert Member of the ICFRE, Dehradun. He got his B.Sc., M.Sc. and PhD degrees from Kurukshetra University Kurukshetra. He served the Departments of Botany and Microbiology, Kurukshetra University for 34 years, and joined the teaching faculty in the same Institute and served as Professor & Chairman for 11years, supervised 23 PhD scholars & over 35 M.Phil. students; Published 180 research papers/reviews/chapters; Over 55 abstracts, attended over 35 National and International Conferences, delivered Lead lectures and Chaired several sessions; Authored/co-authored 16 books, edited 5 books, written 2 manuals, and Proceedings of an International Conference published by International Publishers (04) and National Publishers (19). He is an Honorary Professor & Research Advisor at the Sardar Bhagwan Singh University, Dehradun (Uttarakhand).

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Chlamydomonas CO_2 Concentration Mechanism (CCM) and its sustainable CO_2 sequestration potential

The CO_2 Concentration Mechanism (CCM) in *Chlamydomonas* is an adaptation to changing CO_2 availability and constraints imposed due to the less efficient CO_2- fixing enzyme, RuBisCo. It depends upon rapid scavenging of CO_2 and active uptake and transport of both HCO_3^- and CO_2 to the site of RuBisCo. The induction of CCM takes place under low or very low CO_2 conditions and accumulates 100-fold more CO_2 than environmental CO_2, representing the most efficient CO_2 pumping system discovered so far. The present work is planned with an idea that exposure of cells to gamma irradiation may develop high CO_2- requiring mutants. This kind of use of radiation induced mutagenesis for developing plant cells with high biomass assumes lot of importance owing to the association of regulatory and safety issues with GM cells. The studied objectives were to screen the effect of gamma irradiation on *C. reinhardtii* and to analyze the physiological and biochemical alterations induced by gamma irradiation across various CO_2 concentrations and light conditions. The cells were exposed to the gamma irradiation (G-5000) at Baba Atomic Research Centre, Mumbai. The results revealed that both colony and cell numbers decreased with increasing gamma radiation. Cells exposed to gamma radiation exhibited more chlorophyll and carotenoid content, notably at 200Gy. Interestingly, irradiated cells exhibited twofold increased biomass under high CO_2 and high light conditions. The mutants displayed aberrant starch sheath, thylakoid membrane organizations, PS activities, and multiple pyrenoids with high CO_2 needs. The gamma radiation-based random mutagenesis and screening led to the identification four putative high carbon requiring mutants.

Biography

Prof. K. Mallikarjuna is working as a professor at Botany and Microbiology Department of Acharya Nagarjuna University. Prof. Mallikarjuna is a pioneer of Forestry education in the state of Andhra Pradesh. He obtained PhD in 2004 from SVU, AP and worked as RA at TIFR and BARC, Mumbai and NIPGR, New Delhi. He served as coordinator of Cluster Innovation Center, and Director of Training and Placement Cell. Two design patents were awarded to him. Prof Mallikarjuna visited Malaysia and Indonesia to give talks in meetings. Prof was PI for 5 research projects, member of 10 professional bodies, supervised 20 PhDs, reviewer for 12 journals, published 60 papers and wrote two books. He organized and presented at 6 national conferences and international meetings. Attended 06 FDPs and organized two FDPS. He has given talks at 06 FDPs by invitation.

Khin Mar Cho[1*] and Chan Chong Wei[2]

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Nutrient profile comparison of leafy vegetables grown in soil, hydroponics, and organic systems

Food security (the reliable access to safe and nutritious food) is a global issue. In Singapore, limited farmland (under 1%) and a highly urbanized population make food security a major challenge for urban farming initiatives. Urban farming has the potential to transform Singapore's agri-food industry into one that is highly productive, climate-resilient, resource-efficient, and sustainable. It supports the Singapore Food Agency's '30 by 30' target of sustainably producing 30% of the nation's nutritional needs by 2030, thereby reducing reliance on imports. In the recent update, Singapore transitioned from the '30 by 30' initiative to the 'Singapore Food Story 2' framework. By 2035, the country aims to locally produce 20% of essential nutrients from fibre (vegetables, bean sprouts, mushrooms) and 30% of proteins (eggs, seafood), emphasizing sustainable, resource-efficient, and scalable farming solutions to enhance resilience. These updated, more targeted objectives emphasize efficient, scalable, and sustainable local farming practices to strengthen resilience. In efforts to strengthen local food production, Singapore has increased more farms growing indoor/outdoor hydroponic leafy vegetables adopting this technology. However, many consumers perceive soil-grown vegetables having superior taste and healthier compared to those cultivated through hydroponics. A comparative study was conducted to investigate the nutritional value of leafy vegetables cultivated under three different systems: (i) conventional soil-grown, (ii) soil-less hydroponics, and (iii) organic-grown. The nutritional profiles include carbohydrates, protein, fat, and macro- and micro-nutrient content of selected leafy vegetables grown under three different methods. The insights from this project could help considerations for strengthening local food production while optimizing profitability for producers.

Biography

Dr Khin Mar Cho is a scientist under CROPS (Centre for Research & Opportunities in Plant Science), School of Applied Science, Temasek Polytechnic. Mar Cho has over 15 years of experience in agricultural and industrial research. Her research areas are growing microgreens and their nutritional profile, optimisation of hydroponics and aquaponics growing systems, urban farming technology, composting methods, sustainable agriculture, soil fertility and soil quality management, plant nutrition, plant tissue culture techniques for orchids, ornamental, and aquatic plants, etc.

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Report of pathogen identification and preliminary control technology on fruit rot and leaves blight on *Macadamia ternifolia*

Macadamia is native to Australia with important nutritional and economic value. After being introduced in my Country, it has been planted in Yunnan, Guangxi and other places on a large scale. In this study, samples of macadamia fruit rot and leaf blight fungal diseases were collected from Yingjiang Country, Southern Yunnan Province. Part of the fungal strains were isolated, and the pathogens were verified by Koch's postulates. The identification of pathogen species is carried out through the observation of the morphological characteristics of pathogens and the phylogenetic analysis based on multiple genes. On the basis of observing the biological characteristics of pathogens, the study conducted biological and chemical control of pathogens experiments.

The main findings are as follows: Isolation, purification and pathogenicity determination of the pathogens of macadamia fruit rot and leaf blight: The tissue separation method was used to separate, purify and determine the pathogenicity of macadamia fruit rot and leaf blight. A total of 20 fungi were isolated from the diseased fruits of macadamia fruit rot. After Koch's postulates experiment, Lasiodiplodia pseudotheobromae was identified as the pathogen of the disease. A total of 24 fungi were isolated from diseased leaves of macadamia leaf blight. After Koch's postulates experiment, Beltrania pseudorhombica was identified as the pathogen of the disease.

Identification of the Types of Pathogens: Colonies of *L. pseudotheobromae* which grew on PDA were regularly round, and reached an average 60mm after 3 days in the dark at 25°C. The conidia are produced in the conidiomata. Aerial mycelia were dense, felted, and grey-white

at early stage. With age, the color darkened and became pale olivaceous grey to olivaceous grey. Mature conidia were brownish, longitudinally, striate, 1-septate and thickened wall. The fungal taxonomy was further analyzed under molecular identification. The Internal Transcribed Spacer (ITS) region, and translation elongation factor 1-α (tef1-α) of the fungal isolates. These characteristics were in accordance with the morphological and molecular identification of *L. pseudotheobromae*. Colonies of *B. pseudorhombica* which grew on PDA were regularly slowly at the beginning. The colonies showed a fluffy spreading type, the color darkened and became pale olivaceous grey to olivaceous grey. Mature conidia went from green-yellow to brownish, solitary, biconical, with short appendage filaments connecting the tail, without septum. The fungal taxonomy was further analyzed under molecular identification. These characteristics were in accordance with the morphological and molecular identification of *B. pseudorhombica*.

Biological Control and Chemical Control: Biocontrol fungus (SMEL1) and biocontrol bacteria (*B. velezensis*) YCEB-20 had an inhibition effect on the mycelial growth, appressorium formation and maturation of the pathogens of macadamia fruit rot and leaf blight. The results of the susceptibility test of the *L. pseudotheobromae* and *B. pseudorhombica* to six chemical agents showed that the agents had different effects on the growth of the hyphae and spore germination of the two pathogenic fungi. The above research provides a certain reference for the prevention and control of macadamia fruit rot and leaf blight.

Keywords: *Macadamia Ternifolia*, Pathogen Identification, Biological Characteristics, Pharmaceutical Screening, Biocontrol Mechanism.

Biography

Liu Yuxin is a technical personnel engaged in forestry management at an affiliated unit of the Shanghai Forestry Station, China.

Martha C. Guillén Murrieta*, Alexander J. Chavez, Ruth J. Durand, Jessica M. Aguilar, Marleni Castillo

Tissue culture Advanced propagation, genetic development and nurseries, Camposol S.A., Peru

In-vitro establishment of 'Colt' cherry rootstock from two vegetative tissues

The establishment stage in the micropropagation of fruit plants is limited by the high presence of bacteria and fungi in mother plants, which systemically colonize the explants and invade the in vitro culture medium. This represents one of the most difficult problems to control in in vitro plant culture; especially woody species. This study evaluated the effect of three disinfection treatments on explants: T1 (3% NaDCC), T2 (1.25% sodium hypochlorite+96º ethanol), and T3 (2g/L sulfur+10% PPM), aiming to achieve successful in vitro establishment. Contamination and phenolization (tissue oxidation) were assessed in two types of explants: (i) Nodal segments and (ii) Meristematic buds, under the three disinfection treatments, along with immersion in an antioxidant solution to control phenolization in disinfected explants. Contamination in the explants began to appear on the second day, while phenolization was observed from the fifth day onward. A completely randomized experimental design was employed, applying ANOVA and Tukey test for comparing means at 5%. Significant differences among treatments were found after 35 days of in vitro establishment. Treatments T1 and T2 showed no significant differences in the disinfection of either nodal segments or meristematic buds, achieving between 50% and 52.3% aseptic cultures. The best treatment obtained was T3 for the disinfection of meristematic buds, achieving 80% aseptic cultures and a low phenolization rate of 10%, when the meristematic buds were immersed in an antioxidant solution composed of citric acid and ascorbic acid, both at a concentration of 0.25g/L for 20 minutes.

Biography

Martha C. Guillén Murrieta Biologist is certified as a CONCYTEC Researcher, RENACYT code: P0080672, María Rostworowski Group-Level III, Certification in Responsible Conduct in Research (CRI)-CONCYTEC Peru. She has experience in biotechnology, plant physiology,

genetics, biological control, systemic disease control, and in vitro clonal propagation technologies in crops such as blueberries, vines, fruit trees, forestry, sugar cane, and ornamental plants. In addition, She has knowledge of molecular biology applied to biotechnology. Martha has experience in the development of technical profiles, management of basic, applied and innovative research projects, with knowledge of the interpretation and application of OSHA, ISO 17025 and Global Gap 5.0 regulations.

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The seasonal influence and the alterations in microbial and physicochemical parameters of fermented cocoa beans

Cocoa is an important commercial plantation crop in India, cultivated primarily for its beans, which are the major raw materials for chocolates and confectionary industries. Cocoa being a tropical crop, India offers considerable scope for the development. Cocoa is mainly grown in Kerala, Karnataka, Andhra Pradesh and Tamil Nadu. India's cocoa production reached 27,600 metric tons in 2024, from a significant increase from 19,000 metric tons in 2017. The area under cultivation also expanded to over 110,000 hectares. Cocoa cultivation provides a profitable supplementary income to farmers when intercropped with coconut and arecanut. The demand for cocoa in India is increasing rapidly, driven by the expansion of the chocolate, beverages and confectionery sectors. Annual domestic consumption is estimated to be much higher than production, resulting significant imports, mainly from African and south American countries. To bridge this gap, efforts are being made to promote domestic cultivation, improve processing technologies and introducing high yielding hybrids. The primary stage of chocolate making is fermentation of ripened cocoa beans, one of the crucial steps responsible for the development of flavour and colour in chocolate. Fermentation is a microbiological process where microorganisms such as yeast, lactic acid bacteria and acetic acid bacteria are playing a vital role in enhancing the quality of cocoa beans. This study mainly focused on seasonal impact on microbial population of fermented cocoa beans and the changes in physico chemical characters of the beans after fermentation. Cocoa beans subjected to fermentation by using different methods such as heap, fermenter, tray and basket. The seasons are categorized pre-monsoon (March-May), monsoon (June-September) and post monsoon (October-December). A correlation study was carried out based on the microbial population and physico chemical variables during different seasons. The microbial load was highest during the pre-monsoon

season, while monsoon conditions with high humidity and rainfall reduced microbial activity. Among fermentation methods, the heap method consistently showed the highest microbial count and better fermentation performance. Physical parameters like fermentation index and bean recovery were superior in the heap method, especially during the pre-monsoon season. Overall, environmental factors such as humidity and rainfall increased moisture content and free fatty acid levels in cocoa beans during the monsoon. There is a positive correlation between the microbial load and the quality parameters, indicating This the microbial activity plays an important role in fermentation. To enhance quality during off season, a starter culture of active microbial flora can be managed and utilized to improve the fermentation process and the quality of beans under unfavourable climatic condition.

Mohammad Kamal Abhary

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Physical and biochemical stimulants of crop performance

The current challenges of crop agriculture include facing climate change, depleted natural resources, and plant diseases, increasing the intensity of biotic and abiotic stresses that lead to losses of crop productivity. Although maximizing crop production relies on the use of chemical inputs such as pesticides and fertilizers to enhance crop performance, these synthetic chemicals threaten the environment and cause unsustainability of future agriculture.

In this study, an alternative ecofriendly system is presented to stimulate crop performance through magnetic seed priming and the usage of natural biochemical stimulants. The magnetic-primed seed showed a significant increase in germination rate and speed, where, primed plants exhibited enhanced growth characteristics, including longer shoots and roots, larger leaf area, more root hairs, higher water content, and more tolerance to salinity levels, up to 200mM NaCl. Seed mineral analysis showed a redistribution between the embryo and endosperm, On the other hand, plants treated with Azaphilone pigment, derived from *Talaromyces* fungi, developed trichomes, root hairs, higher biomass, root to shoot ratio, and tolerance to 150mM NaCl. Results of this study illustrate the positive effects of the physical magnet priming and the biochemical stimulation effect on the growth and development of crops in terms of its germination, growth, and salinity tolerance.

Biography

Dr. Abhary studied Cell Molecular Biology /Biotechnology at the University of Missouri St. Louis, USA in 2010. Developed plant with enhanced protein content. Before that, worked on Gene silencing strategies of begomoviruses in plants at the University of Wisconsin-Madison in 2003. Dr. Abhary is an associate professor faculty member at the Biology Department in Taibah University, working on different subjects and focused on the biotechnological uses of plants in the environment.

Professor Dr. Mohammad Kamil

Director General Lotus Holistic Health Institute, Abu Dhabi, UAE

Quality control and standardization of medicinal and aromatic plant

In the recent years with ever-growing commercialization in the field of medicinal plants and herbal medicines, there has been an instant demand for quality control of the drugs used in this system. For this standardization is usually recommended as the solution to the problem.

The challenges are innumerable and enormous, making the global herbal market unsafe. This talk seeks to enlighten physicians, pharmacists, consumers and stakeholders in herbal medicine on the need to establish quality parameters for collection, handling, processing and production of herbal medicine as well as employ such parameters in ensuring the safety of the global herbal market. The processes of good quality assurance and standardization of medicinal plants and finished herbal products will also be discussed.

In the present study an attempt has been made to study the medicinal plants in general from Selection of Medicinal Plants; Good Agricultural Practices (GAP); Good Cultivation Practices (GCP); Good Field Collection Practices (GFCP); Technical Planning; Population density; Geographical distribution; Topographical maps; Collecting techniques & proceedures; Source and Period of Collection; Identification; Storage; Chemical standardization; Assay; Current Good Manufacturing Practice (CGMP); Pre clinical studies to clinical approach; Good Marketing Practice (GMP), with special reference to maintain standardisation at each and every stage and subsequent production of quality raw plant materials/products.

Different stages, i.e, Quality control studies of raw plant materials, Controled studies of method of processing of medicinal plants, Quality control studies of the finished product, Standardization proceedures at each stage from birth of the plants up to its clinical application & marketing have been described. Fingerprinting and adulteration of pharmaceuticals will be in detail.

Biography

Professor Dr. Mohammad Kamil M.Sc.; M.Phil.; Ph.D.; D.Sc.; Chartered Chemist (U. K.) and Fellow Royal Society of Chemistry (London), has worked in various capacities. As In-charge-Drug Standardization lab. CCRUM, Ministry of Health-India, Associate Professor at Hamdard University, India; Professor & Head Department of Pharmacognostic Science, Zayed Complex for Herbal Research & Traditional. Medicine, Ministry of Health, UAE (1996-2010); Head TCAM Research at Department of Health, Abu Dhabi (2010-2020). Presently working as Director General, Lotus Holistic Healthcare Institute, Abu Dhabi, UAE since 2021. He is heading the Scientific Committee for the Sheikh Zayed International TCAM Awards. Recipient of many honours and awards lastly received Sheikh Zayed International Award in Traditional Herbal Research in 2020.Produced 20 Ph. D. and M.Phil. students besides guiding a huge number of M. Sc. dissertations and 40 Interns. More than 800 research papers with more than 8000 citations are at his credit.

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Identification of salt tolerance genes in native plants in Qatar to enhance crops production

Salinity is a substantial obstacle to agricultural land productivity. Arid and high-temperature locations frequently encounter salinity, which constrains agricultural methods in these locales. Halophytes survive in saline environments and are valuable for examining plant adaptations to salt stress, halophyte plant (*Limonium axillar, Arthrocneinum glaucum, Suaeda Vermiculata, Salsola Soda* and *Halopeplis perfoliata*). This work examined salt tolerance genes in a typical halophyte species from Qatar environment, by an integrated physiological and molecular genetics methodology. Plants underwent control and high-salinity treatments, after which genomic DNA was extracted from leaf and root tissues. Primers specific to genes were developed utilizing conserved areas of established gene families associated with salt stress, including ion transporters, transcription factors, and antioxidant enzymes. Target genes were amplified by Polymerase Chain Reaction (PCR), and the amplicons were validated through gel electrophoresis and subsequently purified for sequencing. Sanger sequencing validated specific candidate genes, whereas high-throughput sequencing on an Illumina platform produced extensive sequence data for comparative research. Bioinformatic investigations, encompassing sequence alignment and functional annotation, were performed to identify salt-responsive genes and evaluate sequence variation linked to salinity tolerance. The findings identified a collection of genes associated with ion homeostasis, osmotic regulation, and stress signaling pathways indicative of halophytic adaptation. These findings demonstrate that halophytes can serve as significant sources of genes to enhance crop growth in saline circumstances. This study highlights the significance of halophytes as genetic reservoirs for enhancing crop performance in salty conditions.

Keywords: Salt Tolerance, Halophytes, DNA, PCR, Sequencing, Alignment, Bioinformatics.

Biography

Dr. Mona Ali Al Balushi, got a PhD in Gene Transformation from the University of Bristol in 2022, has been working in Agricultural Research Department at the Ministry of Municipality since 2006, where she has contributed to the implementation of research projects by employing the latest biological and molecular technologies in the study and analysis of plants. Her work includes supervising laboratory projects and developing genetic analysis methods. During career, she held several positions, most notably as a biotechnology expert. Deputy head of the scientific team of the Research and Food Security Committee, and the country's representative to the FAO for Microbiology and Biocontrol. She has contributed to highlighting biotechnology by initiating a Biotechnology Day at the Ministry. She has also gained extensive experience in gene isolation and identification.

Dr. Neeraj Bainsal

Associate Professor, UIPS, Chandigarh University, Gharuan, Mohali, India

From data to discovery: Artificial Intelligence (AI) in plant biology

Artificial Intelligence (AI) is quickly changing the way we study and work with plants, giving us new tools to better understand, grow, and manage them sustainably. Its uses are wide-ranging, from identifying plant species and detecting diseases to predicting crop yields and improving breeding strategies. By applying AI methods such as machine learning and image recognition, researchers can analyse complex plant data more accurately, uncovering important traits and the molecular processes behind them. Tools like digital phenomics and advanced data integration make it easier to visualize and compare large, diverse datasets, driving innovation in food and agricultural technologies. While AI holds great promise, making the most of it requires collaboration between scientists, industry, and other stakeholders, as well as careful consideration of ethical and societal impacts. Overall, AI is poised to transform plant science, offering both deeper understanding and practical solutions for sustainable agriculture.

Biography

Dr. Neeraj Bainsal is an academic and researcher specializing in pharmacognosy currently working as an Associacte Professor in Chandigarh University since last decade. Her work focuses on the evaluation of medicinal plants, development of novel herbal formulations, and the integration of modern analytical and digital approaches in plant-based research. She has authored 27 research and review papers, contributed 2 book chapters, and holds one published patent and one filed patent in the field of herbal and natural product research. Her academic interests include ethnopharmacology, sustainable use of medicinal plants, and emerging technologies in plant and pharmaceutical sciences.

N. S. Kottearachchi[1*], P. Gandham[2], S. M. Amath[1], N. Baisakh[2*]

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Revealing allelic variations in candidate genes associated with grain yield under salinity stress between two contrasting rice genotypes

With the aim of assisting the breeding of salinity tolerant rice varieties by incorporating tolerance-associated candidate genes with desirable alleles, we previously re-sequenced the whole genome of two varieties, At354 (salinity tolerant) and Bg352 (salinity susceptible), using Illumina Hiseq 2000 platform. The sequence reads were mapped to the reference genomes, *Oryza sativa* japonica group cultivar *Nipponbare* IRGSP-1.0 (GenBank Assembly Accession: GCA_001433935.1). SNPs and InDels of At354 and Bg352 were deposited at the European Nucleotide Archive (ENA). It was hypothesized that At354 possesses favorable alleles for yield under salinity stress as both the yield potential and salinity tolerance traits are higher in At354 than Bg352. This study aims at exploring the nucleotide variants between At354 and Bg352 for previously reported reproductive stage salinity tolerance QTLs and linked genes as an approach to reveal the candidate genes with specific desirable allelic architecture.

A comprehensive literature search was done to assemble QTLs reported on reproductive stage salinity tolerance. QTLs reported on different morphological parameters or related terminologies associated with grain yield were compiled for the annotation of the genes. All these QTLs were identified by screening at reproductive stages of progeny derived from the salinity tolerant and susceptible parental cross combinations. A total of 245 QTLs reported on reproductive stage salinity tolerance were compiled. Genes linked to the QTLs were identified within 100 kb flanking the marker closest to the peak of the QTL using *Nipponbare* rice genome as the reference sequence. Sequence variations for the genes between the two genotypes were identified from SNPs and InDels data sheets. Non-synonymous SNPs causing amino acid changes were determined using SNPEff.

In total, 5000 genes linked to the 245 QTLs were analyzed for their allelic differences between At354 and Bg352. Of the 5000 genes, 139 genes were polymorphic with 184 SNPs between At354 and Bg352. However, only 41 SNPs were located either in exons or 3'UTR or 5'UTR, or Upstream or Downstream over 30 different genes. On the other hand, 406 genes covering 470 polymorphic InDels were identified between At354 and Bg352 of which 138 InDels were found in exons over 132 genes. From further investigations into the SNPs and InDels, we were able to identify five main categories of the candidate genes such as the genes associated with grain development, oxidative reduction and stress relieving, membrane transporter-based ionic adjustments, chlorophyll production, and plant defense and apoptosis were deciphered, which could play important roles contributing to the higher grain yield under salt stress environment.

Acknowledgements: Authors acknowledge NRC-16-16 research project (National Research Council, Sri Lanka) for providing the DNA sequences. Also authors acknowledge US-SL Fulbright Commission, Colombo for giving an opportunity to Dr. Nisha Kottearachchi to perform this collaborative research at the Louisiana State University, USA.

Keywords: Genes, Oryza Sativa, QTLs, Salinity Tolerance, Yield.

Biography

Dr. Nisha S Kottearachchi is an academic and researcher currently working as a Senior Professor in Biotechnology at the Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka. Her research area mainly focuses on plant genomics and tissue culture.

N. S. Kottearachchi
Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Fragrance in rice (*Oryza sativa* L.) caused by natural mutants and CRISPR/Cas9 mutagenesis

Rice fragrance is one of the most highly valued traits, commanding higher prices on the global market. Basmati and Thai Jasmine rice are the two most popular aromatic rice varieties that are sold at high prices in the world market. The 2-Acetyl-1-Pyrroline (2AP) is regarded as the major aromatic compound that contributes to the fragrance in many of the aromatic rice varieties, although 100s of other volatile compounds are reported at minor levels. The causal gene for 2AP type fragrance has been well documented as a mutation occurred in *Badh2* gene that causes a nonfunctional Betaine Aldehyde Dehydrogenase 2 (*BADH2*) enzyme, proving that mutations are not always hazardous, but a nature's gift. From an extensive literature survey and DNA sequence analysis based on sequences available in the Rice SNP-Seek-Database of the International Rice Research Institute, we identified different types of mutant alleles in the *Badh2* gene that cause fragrance in rice. Of all mutation types, the *badh2.1* allele, possessing an 8 bp deletion and 3 SNPs in the 7th exon of the *Badh2* gene, was the most prevalent type across Asian rice germplasm *in silico* tested. Accordingly, the second most prevalent was the *badh2.7* allele, having a G insertion in the 14th exon. Multiplex PCR reported with *ESP, IFAP, INSP* and *EAP* primers well discriminates the *badh2.1* allele from the non-fragrant allele. We developed a DNA marker, namely, *Bad2.7CAPS* to discriminate wild and mutant alleles of *badh2.7*, which could be used in Marker-Assisted Selection (MAS) breeding studies. Similarly few such different types of markers have been reported by a few other countries, as they possess different rice varieties with varied types of mutations in the *Badh2* gene, facilitating breeding varieties for rice fragrance.

With the development of gene editing technology, several research papers have reported on the creation of novel fragrant alleles in the *Badh2* gene of non-fragrant rice varieties. Accordingly, the *Badh2* gene has been edited using the CRISPR/Cas9 tool, and finally, only *Badh2*-

edited plants lacking the CRISPR/Cas9–*Agrobacterium* gene construct were selected by subsequent breeding. The volatile profiles have been confirmed with an increased level of 2AP in the *badh2* gene-edited plants. Hence CRISPR/Cas9 tool has demonstrated as a promising method to introduce aroma trait to non-aromatic rice varieties by creating novel mutant alleles of *badh2*, which shortens the time taken for developing aromatic rice compared to cross-breeding followed by MAS methods.

Keywords: Fragrance, Rice, *Badh2*, CRISPR/Cas9, 2-Acetyl-1-Pyrroline.

Acknowledgment: All collaborators, postgraduate students, undergraduate students, and the National Research Council, Sri Lanka (NRC-09-11 grant), are acknowledged for supporting the project on characterization of fragrance gene in Sri Lankan rice germplasm.

Biography

Dr. Nisha S Kottearachchi is an academic and researcher currently working as a Senior Professor in Biotechnology at the Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka. Her research area mainly focuses on plant genomics and tissue culture.

Dr. Priti Saxena*, Kailan Kidder, Erwing Castillo, James Weeks
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Functional contribution of PSY1 and SlFSR to fruit quality variation under organic cultivation

Tomatoes are among California's most important agricultural commodities, underpinning the state's economy and contributing to food security. Yet the industry faces growing pressure from food waste, climate change, and rising consumer demand for organic produce. Improving tomato fruit quality and extending shelf life are key strategies to reduce spoilage, boost marketability, and enhance sustainability across both conventional and organic systems. Recent identification of tomato-specific genes, including the fruit shelf-life regulator *SlFSR,* creates new opportunities to strengthen traits that matter directly to California growers and supply chains.

Tomatoes (*Solanum lycopersicum)* are valued for their culinary versatility and nutritional benefits, especially antioxidants like lycopene that drive both red color and health appeal. However, extending shelf life without sacrificing quality remains difficult. *SlFSR,* has been shown to regulate shelf life by influencing cell wall–modification genes without disrupting ripening, while lycopene biosynthesis is controlled by Phytoene Synthase (PSY1). To examine how these genes behave in organic breeding, two organic lines (Royal Iris and Krimson Round) were crossed to produce reciprocal hybrids, and parents, F_1, and F_2 generations were grown in a certified organic field. Phenotypes were recorded and qRT-PCR was used to quantify *SlFSR,* and PSY1 expression across generations. Preliminary results indicate that hybridization increases expression of both genes in F1 plants, consistent with improved shelf life and carotenoid accumulation, while the F2 generation shows wider variation reflecting inheritance and selection potential. Together, the findings suggest that traditional breeding paired with expression-based selection could offer a practical, sustainable path to reducing food waste and improving nutritional quality in California's organic tomato production.

Biography

Dr. Saxena is an Assistant Professor in the Plant Science Department at Cal Poly Pomona's Huntley College of Agriculture. She holds a PhD in Plant Biology, specializing in turfgrass breeding, from Rutgers University, NJ, USA. Dr. Saxena is the Director of the Center for Turf, Irrigation, and Landscape Technology and Program In-Charge of the Organic Tomato Breeding Program at Cal Poly Pomona. Her research focuses on organic agriculture, plant breeding, sustainable farming, precision agriculture, water conservation, and turfgrass management. She supervises undergraduate and graduate students and teaches plant science courses, advancing agricultural science and education at Cal Poly Pomona.

Remya Mohanraj
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Green biosensing: Plant enzyme–based technologies for environmental monitoring and remediation

Plant enzyme-based biosensors harness enzymes derived from plant sources to catalyze specific biochemical reactions for environmental monitoring and remediation. These biosensors interact selectively with target pollutants including pesticides, synthetic dyes, and industrial chemicals resulting in the generation of measurable signals that enable sensitive detection, even at low concentrations. Beyond detection, plant enzymes can facilitate the transformation of toxic compounds into less harmful or non-toxic byproducts, thereby contributing directly to bioremediation of contaminated environments.

Compared to conventional chemical monitoring approaches, which often rely on harsh reagents and generate secondary pollution, plant enzyme-based biosensors offer a sustainable and environmentally benign alternative. Plant enzymes are naturally abundant, biodegradable, and highly specific, aligning well with green chemistry principles and sustainable environmental practices.

This presentation explores the development, design principles, and applications of plant enzyme–based biosensors in environmental monitoring. Future research directions and technological advancements are highlighted, underscoring the potential of plant enzyme-based biosensors as effective tools for addressing pressing environmental challenges and advancing environmental sustainability.

Biography

Dr. Remya Mohanraj earned her doctorate from Bharathiar University, India. Her area of research includes plant tissue culture, phytochemical analysis and isolation of therapeutic biomolecules from medicinal plants. She has been teaching college students for more than 15 years and has held several leadership roles viz. head of the department, course director and aassistant registrar. She has served in the academic council and board of studies and facilitated curriculum development and curriculum changes. In addition, she had initiated and significantly contributed to the development of various laboratories and is a recipient of three grants. Dr. Mohanraj is a reviewer and editorial board member in various International scientific journals. She has published 23 articles in scientific journals and has presented in 25 scientific conferences. She has authored 6 book chapters and is currently a Faculty in the Department of Biology, Houston Community College, Houston, Texas, USA.

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Phytochemistry of the leaves of *Syzygium mundagam (Bourd.) Chithra* headspace, essential oil and cuticular wax chemical profiling

Phytochemical profiling can be carried out using different analytical techniques, of which Gas Chromatography-Mass Spectrometry (GC-MS) has recently been evolved as a fast and comprehensive method for the analyses of Plant Volatile Organic Compounds (PVOCs). The present study reports the PVOCs profiling of the leaves of *Syzygium mundagam* (Bourd.) Chithra a Western Ghats endemic species, belonging to the family Myrtaceae, with traditional medicinal applications. The leaf headspace volatile chemicals, leaf essential oil volatile chemicals and the leaf waxy cuticular chemical composition of *S. mundagam* were analysed through GC-MS. Headspace volatile constituents are responsible for most of the ecological interactions of the plant, and has applications in perfumery, insect control, food sectors. The major headspace volatile constituents were the aliphatic Green Leaf Volatile (GLV) compounds 3-hexanal, 2-hexanal, hexanal and Z-3-hexen 1-ol. The essential oil represents the essence of the plant and represent the complete volatile chemicals in the plant part, and has wide medicinal and ecological applications. The acyclic diterpenoids phytol and isophytol, along with the aliphatic compound 6,10,14-trimethyl, 2-pentadecanone were the major essential oil compounds identified. The extracellular matrix cuticle is a shield against pathogens and regulates water retention in leaves. The aliphatic compounds tetracontane, n-tricosane, squalene, n-tetracosane, and nonacosanal were the major wax constituents. The micromorphological features of the plant have also been investigated, where epicuticular wax crystals and oil granules were detected. The study highlights the application of GC-MS for the rapid and comprehensive chemical characterisation of the plants that is yet to be explored. The data could be used in various sectors such as chemotaxonomy, chemical ecology, medicinal applications, perfumery, insect control and chemogenomics.

Biography

Reshma Rillison R J is a postgraduate in Botany currently pursuing her Ph.D. in Botany at the University of Kerala, with prior qualifications including M.Phil. (2019), M.Sc. (2017) in Botany and B.Ed. in Natural Science (2014). Her research focuses on morphological, phytochemical and phytopharmacological evaluation of endemic plant species from the Western Ghats, and currently she is working on the tree *Syzygium mundagam*. She has presented her research work at national and international conferences and has attended workshops and seminars related to plant sciences.

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Unveiling the role of Exosome-Like Nanoparticle (ELN) mirnas in plant-pathogen interaction using tomato-Fusarium pathosystem

Tomato is one of the most widely cultivated vegetable crops around the world. However, their yield is often poor due to their vulnerability to various phytopathogens. One of the most destructive diseases affecting tomatoes is Fusarium wilt caused by *Fusarium Oxysporum f. sp. Lycopersici* (FOL). Our research is focused on the role of secreted extracellular vesicles or Exosome-Like Nanoparticles (ELNs) in plant-pathogen interaction. The ELNs contain various biomolecules and facilitate cell-to-cell communication by transferring them between cells. The pathosystem of tomato and Fusarium was confirmed through microscopy. The infected seedlings were used to isolate ELNs using a differential centrifugation procedure and characterized using standard procedures. Our studies proved that ELNs from infected tomato seedlings significantly inhibited the spore germination of *F. oxysporum* under *in-vitro* conditions. Sequencing of ELN microRNAs (miRNAs) isolated from 20 days post-infected seedlings revealed 27 differentially expressed miRNAs, among them, five were novel. The miRNAs, miR482b, miR5300, miR171a, miR156E-3p, and miR394a were expressed on the fifth day, while miR396b was expressed on the tenth day, miR166C-3p and miR9470 on the fifteenth day, and miR6023a on the twentieth day. The investigation on the expression of miRNA target genes at various post-infection time points indicated a differential expression pattern matching with the abundance of target miRNAs at the specific time points (5, 10, 15, and 20 days). This study suggested that the transcript levels of defense genes are downregulated after the fifth day, likely due to the upregulation of miRNAs that target these transcripts. These new findings demonstrate, that ELNs carry and distribute miRNAs that target defence genes in infected plants, thereby negatively impacting plant's defence mechanisms.

Biography

Ms. Ritu Kumari is a research scholar in the Department of Botany, Institute of Science, Banaras Hindu University, Varanasi, India. Her research focuses on the role of secreted extracellular vesicles and its components in plant pathogen interaction.

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Integrated experimental and computational insights into the phytochemical composition and bioactivities of *Withania somnifera* varieties

Ashwagandha (*Withania somnifera*), a highly valued medicinal plant of the Solanaceae family, exhibits remarkable therapeutic potential due to its diverse phytochemical composition. This study investigated six Ashwagandha varieties (Pushti, Poshita, Pratap, Chetak, NIM-118, and NIM-101) to evaluate phytochemical content and biological activities across different plant tissues. Phytochemical analyses targeted phenolic compounds, flavonoids, and withanolides using ethanolic-water and withanolide-enriched extracts. Quantitative profiling revealed significantly higher bioactive compound levels in Poshita, Chetak, and NIM-101 varieties.

In-vitro antioxidant assays demonstrated that withanolide-enriched extracts had superior radical scavenging activity, particularly in NIM-118 roots, Chetak leaves, and NIM-101 seeds. Antimicrobial evaluations showed potent activity against gram-positive bacteria such as *Bacillus subtilis* and *Staphylococcus aureus subsp. aureus*. High-Resolution Mass Spectrometry (HRMS) helped identify variety-specific withanolides and structural analogs linked to observed bioactivities.

In silico molecular docking against oxidative stress and inflammation-related targets, combined with ADMET pharmacokinetic simulations, revealed strong binding affinities and favorable drug-like characteristics. Network pharmacology analyses further indicated associations with neuroprotective, adaptogenic, and immunomodulatory pathways.

The integrated *In-vitro* and *in silico* findings highlight distinct chemotypic variations among Ashwagandha varieties and identify promising candidates for pharmaceutical development. This comprehensive analysis enriches the chemotaxonomic understanding of *Withania*

somnifera and provides a scientific basis for varietal selection, formulation standardization, and biotechnological applications in modern herbal therapeutics.

Keywords: *Withania Somnifera*, Withanolides, Phytochemicals, Antioxidant Activity, Antimicrobial Activity, HRMS Analysis, In *Silico* Studies.

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Rare and under-cultivated vegetable crops for livestock nutrition and human health

Health and nutrition play a prime role in human longevity. Leafy vegetables are plant products used as salad, steamed, or cooked to supply food and support health. Some of these (*Alternanthera sessilis, Aerva lanata* and *Moringa olefera*) are under-cultivated globally due to their production constraints, climate adaptability, lack of knowledge in the supply of seed to non-traditional areas, and are underutilized due to a lack of awareness, though available in the market. The description of the vegetable part(s) of the crop, their production statistics if available, nutrition, and health benefits through their inclusion in human or livestock diet, research done to date with improvements in breeding and biotechnology will be presented.

Biography

Dr. Satya S. S. Narina is a distinguished horticultural scientist, educator, and author with over two decades of contributions to research and academic publishing. With roots in a traditional farming family in Konaseema, Andhra Pradesh, India, she earned her Ph.D. in Vegetable Science from the prestigious Indian Agricultural Research Institute in New Delhi. Her career began with a focus on improving minor tuber crops at Agriculture research Station, YSR Horticulture University, in Andhra Pradesh India. It evolved into research on nutritionally important and emerging crops with institutions such as Virginia State University, and USDA-ARS.

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Dual-purpose biotechnology from the sea: Bioethanol production and heavy metal remediation using *Ulva lactuca*

Marine macroalgae present an underexplored opportunity for sustainable bioprocessing with applications beyond fuel generation. In this study, the green seaweed *Ulva lactuca* was employed in a dual-purpose strategy: Production of bioethanol and reuse of fermentation beads for environmental remediation. Polysaccharides extracted from acid-hydrolysed *U. lactuca* were confirmed by phenol–sulphuric acid and DNSA assays. Fermentation was carried out using yeast immobilized in calcium alginate beads prepared with PolyEthylene Glycol (PEG), a formulation offering enhanced stability and novelty. Distillation yielded bioethanol, the identity of which was validated by GC–MS, NMR, and UV–Vis spectroscopy. The dual-purpose approach was demonstrated by repurposing the spent calcium alginate–yeast beads as biosorbents for heavy metal removal. Atomic absorption spectroscopy confirmed significant adsorption of copper ions, highlighting their utility in water purification. Additionally, the bioethanol produced displayed antibacterial activity against *Escherichia coli,* expanding its potential applications to the biomedical domain. This integrated workflow underscores the promise of *Ulva lactuca* as a versatile marine biomass for renewable energy and environmental biotechnology. By coupling biofuel production with post-fermentation bead reuse, the study advances a circular blue biorefinery concept, demonstrating how marine resources can address global challenges in both clean energy and water quality management.

Biography

Shambhavi Srivastava is currently pursuing her M.Tech in Biotechnology at Vellore Institute of Technology, Vellore, Tamil Nadu. She completed her B.Tech in Biotechnology from Amity University, Noida, Uttar Pradesh. As part of her second-year dissertation, she is undertaking an internship in the biomedical domain at the Indian Institute of Technology Delhi. Her research interests include marine biomass valorisation, bioethanol production, biopolymers, and their biomedical application.

Sivamathini Rajappa

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Chloride channels play important role in salt tolerance of plants

Increased soil salinity is a growing challenge for crop production, which adversely affects crop yields in ~20 % of cultivable land worldwide. This problem is predicted to affect >40% of agricultural lands in the coming decades and major threat to food security globally. The excess accumulation of soluble salts, especially Sodium Chloride (NaCl), in the roots severely impedes plant growth, reducing crop productivity. Previous efforts to identify solutions for mitigating salinity stress have focused primarily on cations such as Sodium (Na^+) and its transport. It is important to explore the effects of counter-anions such as Chloride (Cl^-) on root growth and understand the uptake and transport of Cl^- in plants. This knowledge could be used to improve salinity tolerance in crops in the future.

Our study shows how Arabidopsis chloride channel, AtCLCf plays an important role in salt tolerance. Our findings show that WRKY9 transcription factor regulates the expression of AtCLCf under salt stressed conditions and the increased intracellular NaCl levels induce the translocation of AtCLCf from the Golgi apparatus to the plasma membrane via trans-Golgi network using an AtRABA1b (BEX5)-mediated pathway. The electrophysiological studies (patch clamp) with Human Embryonic Kidney 293 (HEK293FT) cells show that AtCLCf functions in efflux of Cl^- from the cells. The subcellular translocation of this CLC in the root cortex tissue and epidermis represents an essential salt tolerance mechanism in Arabidopsis.

Biography

Dr. Sivamathini Rajappa is a Postdoctoral Research Fellow at the National University of Singapore (NUS), working at the interface of plant biology and nanotechnology under the supervision of Prof. Tedrick Thomas Salim Lew. Her research focuses on developing biomimetic nanotechnology approaches to improve plant resilience to environmental stresses, particularly salinity, and to design nanoparticle-based delivery systems for plant biotechnology and biosensing applications. She obtained her Ph.D. in Biological Sciences (Plant Biology) from NUS, where her research on molecular characterization of ion transporters involved in plant salt tolerance earned her the Gold Medal for the Best PhD Thesis awarded by the International Society of Plant Molecular Biology. She previously worked as a Postdoctoral Research Fellow at Seoul National University, South Korea, studying molecular mechanisms regulating xylem development in Arabidopsis. Her research integrates molecular biology, plant physiology, abiotic stress and nanotechnology, and she has published in leading journals including two papers in Nature Communications, as well as Nanoscale, Frontiers in Plant Science, and Plant Cell Reports. She is also actively involved in mentoring students and contributing to interdisciplinary research aimed at advancing sustainable agriculture.

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Gene expression study of iron transporters in *Amaranthus tricolor L.*

Iron (Fe) is an essential micronutrient required for plants' physiological and biochemical processes like photosynthesis, respiration, and DNA synthesis. While iron is present in large quantities in the Earth's crust, it is often rendered unavailable to plants under conditions of calcareous or alkaline soil, causing widespread iron deficiency that greatly impedes crop productivity and nutritional quality. *Amaranthus tricolor,* a nutritious leafy green vegetable, is an appropriate plant model to study iron uptake mechanisms since it is tolerant, iron-rich, and displays typical physiological responses to iron deficiency. The study aims to investigate the molecular mechanisms underlying iron uptake in *Amaranthus tricolor*, with a focus on the expression of the Iron-Regulated Transporter 1 (IRT1) gene and Fe^{2+} transporter under iron-sufficient and iron deficient conditions through tissue culture-based propagation, RNA isolation, and quantitative Real-Time PCR (qRT-PCR) techniques. IRT1 is a key component in the Strategy-I iron acquisition pathway, which is employed by non-graminaceous plants to absorb iron from the soil. Seeds of *A. tricolor* were grown on Murashige and Skoog (MS) medium with and without iron supplementation. Root tissue of the plants was utilized for RNA extraction of high quality, cDNA synthesis, and qRT-PCR utilizing gene-specific primers. Actin was employed as the internal reference gene to standardize the expression levels. The results showed a dramatic upregulation of IRT1 and the Fe^{2+} transporter gene in iron-limited condition, establishing its important function in iron uptake and homeostasis. This study highlights the importance of molecular methods in elucidating plant nutrient transport mechanisms, and the knowledge can be used to develop iron-biofortified crops, which are crucial for public health initiatives and sustainable agriculture, as iron deficiency is a widespread problem, particularly in regions reliant on plant-based diets.

Biography

Smitha D G is an Assistant Professor of Botany at University College, Thiruvananthapuram, Kerala, India, affiliated with the University of Kerala. With 14 years of teaching experience at undergraduate and postgraduate levels, she brings extensive academic expertise to her role. Currently pursuing her Ph.D. under the supervision of Dr. Cinthya Christopher, Associate Professor at All Saints' College, her research focuses on the mechanisms of iron acquisition in selected varieties of Amaranthus tricolor. She has presented her research findings at prestigious national conferences, including the XV All India Conference on Cytology and Genetics (2025) and the XXXV Annual Conference of the Indian Association for Angiosperm Taxonomy (2025).

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Post-transcriptional regulation of abiotic stress response by *EGRBP42* in oil palm

Abiotic stress is a significant limiting factor for plant growth and crop productivity. Understanding the molecular mechanisms that govern stress responses is critical for developing resilient crop varieties. In oil palm, we identified a heterogeneous nuclear Ribonucleoprotein (hnRNP)-like RNA-binding protein, *EgRBP42* as a key regulator mediating the post-transcriptional nucleocytoplasmic RNA transport of stress-responsive transcripts in response to environmental stress. Overexpression of *EgRBP42* in Arabidopsis thaliana conferred enhanced tolerance to multiple abiotic stresses, including drought, salinity, heat, cold, and submergence. This resulted in improved physiological performance, enhanced post-stress recovery response and accelerated flowering, linked to the modulation of flowering regulator gene expression. Our study revealed that *EgRBP42* possesses nucleocytoplasmic shuttling ability via a nuclear localization signal and an M9-like domain and interacts directly with regulator proteins in the nucleus, membrane, and the cytoplasm. *EgRBP42* binds directly to the AG-rich motifs in its downstream target stress-responsive transcripts, promoting their nucleocytoplasmic transport and translation during stress response. Furthermore, the oil palm stable transgenic lines overexpressing *EgRBP42* exhibited enhanced stress resilience under controlled abiotic stress treatments, further confirming *EgRBP42* 's role in enhancing stress adaptation in oil palm. Building on these findings, current work focuses on DNA-free genome editing of *EgRBP42* regulatory elements in oil palm to enhance stress responsiveness while maintaining yield performance under climate variability. These findings suggest that *EgRBP42* plays a key role in modulating transcript availability during stress, leading to better stress adaptation in plants and serves as a potential target for developing climate-resilient oil palm through precision breeding approaches.

Biography

Dr. Yeap Wan-Chin is currently serving as a Principal Scientist II at SD Guthrie Technology Centre Sdn. Bhd., Malaysia. She holds a Ph.D. in Plant Genetic Engineering and Molecular Biology from Universiti Putra Malaysia. Over the past 16 years, she has been involved in oil palm research, with a focus on molecular biology, functional genomics, and genetic engineering. Her work explores areas such as fruit development, oil yield and plant responses to abiotic stress.

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The *Oplopanax elatus* genome reveals the evolution of a Dammara Di ENOL Synthase (DDES) enabling de novo biosynthesis of RK-type ginsenosides

RK-type ginsenosides (Rk1, Rk2 and Rk3) are rare, bioactive dammaradienol-type triterpenoid saponins, yet they are not biosynthesized in cultivated *Panax ginseng*. Their current supply therefore relies largely on heat-induced conversion of dammarenediol-type ginsenosides, an inefficient process that limits scalable production. The Araliaceae species *Oplopanax elatus*, a close relative of ginseng, accumulates the upstream triterpene dammaradienol but does not produce RK-type ginsenosides, providing a natural system to identify the missing enzymatic steps.

Using GC–MS and LC–MS metabolite profiling, we confirmed robust accumulation of dammaradienol in *O. elatus* leaves in the absence of RK-type ginsenosides. We then generated a chromosome-level *O. elatus* genome and, together with transcriptome profiling and biochemical characterization, identified an oxidosqualene cyclase responsible for dammaradienol formation (DammaraDi Enol Synthase, DDES). Comparative genomics across seven Araliaceae species indicates that DDES originated from an ancestral β-amyrin synthase via gene duplication followed by neofunctionalization and subsequent functional specialization. Notably, site-directed mutagenesis demonstrates that a single amino-acid substitution (N260Y) converts DDES into an evolutionary intermediate with broadened product specificity, yielding β-amyrin-, α-amyrin-, and dammaradienol-type activities.

Downstream pathway analysis further suggests that RK-type ginsenoside biosynthesis in *O. elatus* is interrupted by loss of the Cytochrome P450 (CYP) ortholog required for C-12 oxidative tailoring of the dammaradienol scaffold, explaining the observed precursor overaccumulation.

Guided by these insights, we reconstructed the pathway in *Nicotiana benthamiana* by co-expressing *O. elatus* DDES with ginseng CYPs and *O. elatus* C3/C6 glycosyltransferases, achieving de novo biosynthesis of ginsenosides Rk1, Rk2 and Rk3. Together, our results illuminate how triterpene cyclases evolve new scaffold specificities and establish a plant chassis platform for engineered production of valuable RK-type ginsenosides.

Biography

Dr. Yu Wang is a professor at the College of Life Sciences, Northeast Forestry University. His research focuses on gene and genome duplication and how novel functions emerge after duplication, with a particular emphasis on how these evolutionary processes enable plants to produce exceptionally diverse specialized metabolites and how such plant-derived chemistry can be extracted and engineered for pharmaceutical, agricultural, and industrial applications.

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Landscape and m^{6}A post-transcriptional regulation of crop proteome

The crop proteome remains largely under-characterized. Herein, we performed mass spectrometry-based quantitative analysis of proteins across 14 distinct organs of rice and soybean, respectively quantifying 15,174 and 12,855 proteins, and thus constructed the most comprehensive rice and soybean proteome dataset reported to date. Analyses of organ-specific protein expression and co-expression profiles revealed pronounced functional specificity, coupled with marked discrepancies in protein-transcript abundance across different organs. We further mapped N6-methyladenosine (m6A) modifications and validated their pivotal role in the post-transcriptional regulation of protein expression. Through integrative analyses of proteomic and m6A methylomic data, we identified a novel regulator of m6A methylation. Collectively, this comprehensive proteomic and m6A landscape not only advances our mechanistic understanding of rice and soybean biology but also provides a valuable resource for accelerating crop genetic improvement.

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