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Joint Event

9th Edition of Global Conference on

Plant Science and Molecular Biology &

4th Edition of Global Conference on

Agriculture and Horticulture

16-18 September 2024

Rome, Italy

Venue: NH Villa Carpegna, Via Pio IV, 6, 00165 Roma RM, Italy

BOOK OF ABSTRACTS

SEPT

16-18

9th Edition of Global Conference on

Plant Science and Molecular Biology &

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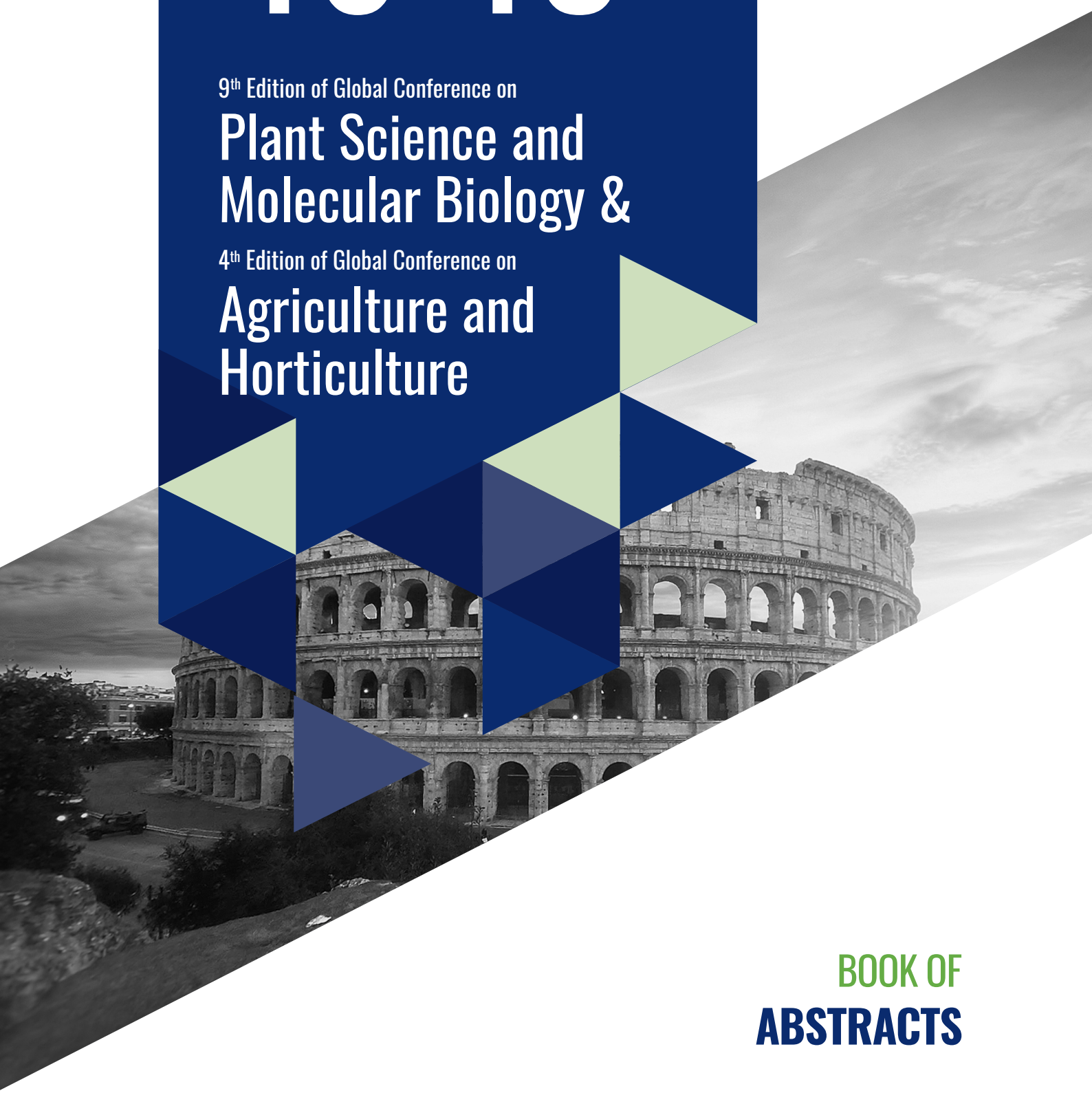

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Thank You All...

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Inail, Italy

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ICAR- Indian Agricultural Research Institute, India

Thank You All...

BOOK OF ABSTRACTS

Welcome Message

Costantino Paciolla

Associate Professor, Department of Biosciences, Biotechnologies and Environment, University of Bari, Italy

Dear Conference Attendees,

It is an honour and great pleasure to write a few welcome notes for the "Plant physiology and biochemistry" session. This session deals with the functioning of plants and how they react to changes under biotic stress, such as pathogens, and abiotic stresses, such as high irradiance, drought, and soil contaminants. Thanks to a multi-disciplinary approach linking molecular and biochemical studies, the comprehension of the physiological mechanisms in plants has improved a lot in the last years. In this context, this session offers a variety of research topics, including (1) Photosynthesis; (2) Photomorphogenesis; (3) Plant hormones functions; (4) Plant nutrition; (5) Environmental stress physiology, and all physiological and biochemical studies regarding the dynamic processes of growth, metabolism, defence, reproduction and communication in plant. It will be a great opportunity for all participants, including young and senior researchers, scientists and academics to gain knowledge with up-to-date research in plant physiology and biochemistry.

Welcome Message

Dachang Zhang

Water & Eco crisis foundation, United States

Welcome to the 4th edition of Global Conference on Agriculture and Horticulture in Rome. The biggest obstacle to improving food security is floods and droughts caused by climate change. Since the first edition the Agri conference has launched a new discipline in water science-- suitaiology--innovated by the wnec foundation. Applying a “long, broad, high and deep" research thought and working mindset, suitaiology advocates for comprehensive solutions to flood disasters and water shortages in the long-term interests of sustainable agricultural development. It profoundly opens up a new perspective that in the water-human-environment (WHE) system the natural situation of water is destructive, and achieved through dimensionality reduction attacks. We need to examine this asymmetric competition with dynamic natural forces from a level higher than the whe system. Once we fully understand it, it's easy to find a suitable solution. The research in suitaiology should help inspire us on how to grasp core issues when we study dynamic changes, no mater which discipline. If existing theories are inadequate, we encourage you to contemplate creating a new theory to achieve your goals.

Welcome Message

Edgar Omar Rueda Puente

Sonora, Mexico

Dear colleagues and general public present at this honorable GPMB-2024 event, it is a pleasure for me to address you on the occasion of Welcome.

I would like to inform you that global food production under adverse environments and that reduce the productivity of conventional crops, environments such as deserts, arid and semi-arid areas, biotechnology has played an important role in overcoming some adversities. There are several examples which are notable examples of the creativity of the researchers, suggesting that biotechnology is playing a significant role in changing the course of humanity in one way or another, and being one of the disciplines and industry that more have advanced in recent years, the injection of capital into it represents one of the best options for investors for the future. The development of events such as the one we will be witnessing GPMB-2024, will show how biotechnology is an interdisciplinary field of enormous applications that helps the development in a very significant way in the present and in the coming years.

Welcome Message

Linas Balciauskas

Nature Research Centre, Lithuania

Dear Conference Attendees,

Welcome to the event! Not many of you are related to the world of field investigations, where farming and wildlife collide. We'll be tackling some big issues, like how agriculture impacts mammal diversity and what we can do about it. From crop damages and livestock predation to habitat loss and pesticide use, we'll explore the many ways agriculture affects our furry friends. But it's not all doom and gloom! We'll also be discussing some exciting solutions, like habitat restoration, wildlife-friendly farming practices, and sustainable land use planning. Plus, we'll be sharing some cool research from Lithuania and beyond, showing how we can improve the capacity of agricultural land to support mammal populations. So let's dive into this wild and woolly world of agriculture and mammals together.

Welcome Message

Nelida Lucia del Mastro

IPEN-USP University of Sao Paulo, Brazil

Dear Conference Attendees,

It is an honor and great pleasure to write a few welcome notes for the session entitled "Agroecology and Sustainable Agriculture". Agroecological approaches have gained prominence in scientific, agricultural and political discourse in recent years, suggesting pathways to transform agricultural and food systems that address these issues. Here we will welcome all substantial works on the principles of agroecology, their historical evolution, manifestations of agroecology as a science, and a set of practices and also a social movement that have emerged from a global multi-stakeholder consultation and synthesis process in the context of presenting transition pathways to more sustainable food systems.

Welcome Message

Rajnish Khanna, M.Sc., Ph.D.

Carnegie Institution for Science & i-Cultiver, Inc., India

Welcome to the “Plant Biotechnology” session. As we gather at this conference, we face a critical need to upgrade the future of our global food system- for it to deliver healthy, nutritious foods under changing environmental pressures. Plant Biotechnology has an essential role to play, and it is paramount that scientists, industry, purveyors, and consumers come together. In collaboration, we can re-imagine the value chain from its current yield-driven motif, to a design that values food quality and planetary sustainability. Plant Biology is poised to be at the core of this new paradigm, from innovation to impact. In this session, entitled “Plant Biology and Global Sustainability”, we will include advancements in (1) Soil and Plant Health, (2) Future of Sustainable Fertilizers, (3) Mode-of-Action of Agricultural Inputs, (4) Overcoming Biotic and Abiotic Pressures, (5) Improving Nutritional Value, and (6) Constructing New Food Value Chains: Science, Education, Informed Decisions.

Welcome Message

Shashi Vemuri

Professor Jayashankar Telangana State Agricultural University, India

Dear Congress visitors

It is an honor and great pleasure to write a few welcome notes for the 4th Edition of Global Conference on Agriculture and Horticulture being organized from September 16-18, 2024 at Rome, Italy. Impact of climate change on insect pests is gaining lot of importance these days as the changing weather and climate is bringing many changes in the pest scenario all over the world. Many of the minor or sporadic pests are becoming major pests causing heavy crop losses in important field crops like Rice, corn, wheat, pulses, oilseeds and other crops of commercial importance including horticultural crops. Thus studying the weather parameters their impact on pests and diseases and correlating them has become a major task these days. This opens new opportunities to breed new hybrids and also test new molecules to achieve higher productivity and to introduce intelligent, different innovative methods to work against crop pests.

Welcome Message

Vijayan Gurumurthy Iyer

Bihar Institute of Public Administration & Rural Development (BIPARD), India

Dear Conference Attendees,

It is an honor and great pleasure to write a few welcome notes for the session entitled “Plant and Environment”. Environmental Quality (EQ) procedures, guidelines and regulations must be complied by the plant science and molecular biological organizations (PSMBOs). It must also be ensured that PSMBOs plan and take balanced decision-making regarding climate and the environment that occurs in the total human rights and public interest. The environmental impact statements (EISs) are the descriptions of the proposed actions, as well as descriptions of the existing environment. Prediction and assessment of environmental impacts on the plant science and molecular biological environment entail a number of technical and professional considerations related to both the predictive aspects and interpretation of the significance of anticipated changes. Impact prediction and assessment for the plant science and molecular biological environment can be called entitled “ecological impact assessment“. The plant science and molecular biological environmental assessment report is proposed to an “environmental impact assessment (EIA)” or an “environmental assessment (EA)” or an “environmental impact statement (EIS)”. “Strategic environmental assessment” (SEA) EQ refers to the EIA process applied to plans, policies, or programs. Programmatic EISs (PEISs) EQ can be used to address environmental implications of the policies, programs and to address the impacts of actions. It will be a great opportunity for the GPMB 2024 participants including young and senior researchers, scientists, public administrators, urban and rural planners and developers and academicians to gain knowledge with the up-to-date research in environmental plant biology and environmental molecular biotechnology for the sustainable development. As climate change looms over our future, many industries, municipalities, and agricultural farm estates are turning to plant science and molecular biology and biotechnology for solutions to make all aspects of our lives more sustainable for the environment.

ABOUT
MAGNUS GROUP

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
CPD Accreditation

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Continuing Professional Development (CPD) credits are valuable for 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 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 collaborators.

Note: Each conference attendee will receive 20+ CPD credits.

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Plant Science and Molecular Biology &

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Agriculture and Horticulture

KEYNOTE FORUM

Monochromatic LEDs lighting affects redox homeostasis and morphological traits in lentil seedlings

It is known that the light is an environmental factor with a key role in plant growth and development processes. In the last years, in addition to the different and conventional lighting modes in greenhouses, very attention towards the use of Light-Emitting Diodes (LEDs) has been paid. This technology includes the use of spectral light with the possibility to choose the quality and quantity of lighting in plant. The use of LED allows to evaluate as the single monochromatic light can affect the redox state in plant cell and some morphological parameters. Particularly, the monitoring of parameters involved in redox homeostasis such as reactive oxygen species, enzymatic and non-enzymatic antioxidant systems, and thiol-disulfide status of proteins, are useful to better comprehend the responses of the plant to the single monochromatic light.

Seeds of *Lens culinaris L.* (lentil) were germinated and grown in darkness (control) or under continuous different LEDs at different light intensities. The analyses were carried out at the early growth stages of the seedlings. The study highlights how quality and quantity of the LEDs light differently affect the biochemical and morphological parameters analysed. Particularly, red monochromatic has a positive effect on biometric parameters such as length and fresh weight whereas blue monochromatic light positively influences enzymatic and non-enzymatic components such as ascorbic acid and phenols. Future studies are needed to conduct an in-depth analysis how the light conditions can strengthen the antioxidant machinery and induce anatomical modifications useful to improve crop productivity and stress resilience through a sustainable approach.

Audience Take Away Notes

- The presentation could better explain the advantages of the application, ensuring its relevance and practicality for the audience
- This know-how will allow the audience to better understand some technological aspects
- This research could allow other researchers to expand their research and teaching
- This methodologic approach will improve the accuracy of the experimental design

Costantino Paciolla*, Benedetta Bottiglione, Silvana De Leonardis

Department of Biosciences, Biotechnology and Environment, Università degli Studi di Bari Aldo Moro, Via Orabona 4, 70125 Bari, Italy

Biography

Dr. Costantino Paciolla studied Biology at the Bari University Aldo Moro, Italia and graduated as MS in 1987. After two years fellowship of Accademia Nazionale dei Lincei in Agricultural Genetics Studies, he obtained the position of permanent researcher and then of Associate Professor in Plant Physiology at the same institution. His research concerns the study of the redox homeostasis in plant cell under biotic and abiotic stress and the influence of light on antioxidant activity and photomorphogenic growth in plants of food interest. He has published more than 70 research articles in journals with impact factors present in Scopus database.

Suitaiology: Environmental protection, water resource creation and agricultural development in mountainous areas

Water, humans and the environment constitute the WHE system. The dynamic state and dynamic development trend of dynamic interactions between water and other members of the system is the so-called water situation. From the perspective of suitaiology, the natural situation of water is mainly destructive, and floods and droughts are two opposite extreme water situations. We must protect the environment while preventing floods and droughts. This is an asymmetrical competition with the dynamic Nature's forces. Although humans have tried countless methods and technologies for thousands of years, conventional existing static water science is not enough to help us understand and deal with this dynamic asymmetric competition. New dynamic scientific theories and thinking are needed to provide guidance on strategies and techniques. Brand-new suitaiology profoundly reveals that the destructive natural situation of water is achieved through dimensionality reduction attacks. Therefore, it is clear that the key to effectively alleviating or even eliminating floods, droughts and and induced geological disasters to a large extent, creating water resources, and maintaining the delicate balance within the WHE system is to adjust the water dimensions and change the water situation through reverse operations. The methods and technologies that have been effective in the past are precisely because they conform to the scientific theory and thinking of suitaiology, but they are not enough. Facing with extreme weather challenges such as heavy rains, floods, and droughts, mountainous areas are the most vulnerable areas, but they are often ignored. We must realize that mountainous areas are the sources of floods and serve as the "water towers" of a river basin. Our goal is to minimize the formation of floods and convert excess surface water into water resources in mountainous areas. This plays a vital role in flood control, drought relief, agriculture, forestry, tourism and water supply throughout the basin. The scientific theory and thinking of suitaiology proposes two fundamental principles, namely, dimension promotion and potential adjustment. Cultivating good vegetation and building appropriate interceptions and deceleration facilities or diversion facilities on slopes to increase the dimension of water activities can significantly weaken or even eliminate the destructive effects of water. The highest art of war is not only to weaken or eliminate unfavorable situations, but more importantly, to turn unfavorable situations into favorable ones. Combining groundwater storage facilities with the control systems of the above-mentioned dimension promotion converts the originally destructive water flow into valuable water resources, effectively turning the mountainous area into an ecological "water tower" for natural water storage and energy-free water supply. During the construction of these

Dr. Dachang Zhang[1]*, Zhangxing Peng[2]

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[2]Beijing Urban Drainage Monitoring Center Co., Ltd. Beijing, China

Biography

Dr. Dachang Zhang received his B.S. and M.S. degrees in hydrogeology & Engineering Geology from the Changchun Institute of Geology and Chinese Academy of Sciences in 1982 and 1985 respectively, then became a researcher at Chinese Academy of Sciences. After his PhD degree in geography from the University of Vienna in 1996 with significant contributions to a national water project of Austria, he was a postdoctoral fellowship and researcher at the University of Waterloo, Canada from 1997-2000. And then, he worked as a consultant in Canada and U.S.A. and become a License Professional Geologist of the State of California since 2007. He also worked for the University of Bijie, China, as a Professor and the Deputy Dean of the Academy for Bijie Experimental Region for water management and rural development in impoverished mountainous areas from 2008 to 2014. He is the Founder and President of the Water &Eco Crisis Foundation, USA, since 2010. In 2012, Dr. Dachang Zhang and his

facilities, both new agricultural lands and ecological zones can be created. The environment of each mountainous area has its own characteristics, and the methods and measures to change the water situation are also different. This time only a general discussion is given. Typical examples in different types of mountains will be gradually discussed at other times in the future.

Audience Take Away Notes

- The audience will learn a novel scientific theory, Suitaiology, which recognizes that combating climate change is an asymmetrical competition with the Nature's forces, the natural situation of water is to damage the environment through dimensionality reduction attacks, dimension promotion and potential adjustment can effectively solve the water problems.
- The audience will learn how to grasp the core points of a dynamically changing research object, and guide our actions and efforts with appropriate scientific theories that can cope with dynamic changes. If no such scientific theory is found, how to create a new one to instead.
- The audience will learn a systematic concept, principle and approach to help them in their job.

team set out to create a new water science—Suitaiology, which was first officially released at the 1st Edition of Global Conference on Agriculture and Horticulture (AGRI 2021) in 2021.

Agrobiotechnological experiences: Cannabis spp. as a new form of production in the desert regions of the world

Secondary metabolites are a source of active ingredients in medications and valuable chemical products, whose pharmaceutical applications are due to their function as analgesics, antibacterials, antihepatotoxics, antioxidants, antivirals, antitumors, fungicides and/or immunostimulants. Sativa, is a herbaceous plant that grows spontaneously in tropical and subtropical regions; Between 400 and 537 chemical components called secondary metabolites have been identified and about 100 are cannabinoids. In recent years it has intensified in the use of medical fines. The expression "medicinal cannabis" refers to the use, recommended by the doctor, of the plant and its components, called cannabinoids, to treat diseases or reduce symptoms. Chronic pain in people is the most common reason cited for using "medical cannabis." Studies show that metabolites under adverse conditions (high and/or low temperatures, salinity, pH, use of brackish water or seawater) and the inoculation of halo-thermotloerants-bacteria that promote plant growth, can increase their effectiveness and quantity. In the northwest of Mexico, there is an interest in evaluating the effect of the edaphoclimatic conditions presented by the Sonoran Desert to evaluate the quality and quantity of chemical components, including cannabinoids, and that is why this information addresses. in pronouncing the importance of deserts, halophytes as prospects tolerant to salinity and for agroindustrial use, irrigation with brackish water or seawater, secondary metabolites, cannabinoids, CBD, halobacteria that promote plant growth.

Audience Take Away Notes

- The audience will be able to identify the importance of agrobiotechnological techniques to produce CBD and its importance; It will help you expand your knowledge about the Cannabis plant; You will realize that the research generated can be replicated and that the results generated can expand knowledge about secondary metabolites in the Cannabis genus, among other more aspects.

Edgar Omar Rueda Puente[1]*, Jesus Ortega-García[1], Pablo Preciado-Rangel[2], Betzabe E. López-Corona[1], Dr. Jesús Ortega García[1], Carmen Lizette Del Toro Sánchez[1], Ramon Francisco Dorame Miranda[1], Jesús Sosa Castañeda[1], Susana Marlene Barrales Heredia[1], Guadalupe Amanda López Ahumada[1]

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Biography

Edgar Omar Rueda Puente is 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). He has been awarded with the degree Doctor Honoris Causa by the International Organization for Inclusion and Educational Quality (OIICE). He is QUALIFIED TO AUDIT AND IMPLEMENT INSTITUTIONAL MANAGEMENT SYSTEMS, UNDER THE STANDARDS LISTED BELOW with SUPPORT from an INSTITUTION accredited by the Mexican Accreditation Entity (EMA). He is also a member of the Intersecretarial Commission on Biosafety of Genetically Organisms Modified in Mexico. He is a founding member of the World Seawater Organization (OMAR) and Scientific Committee, based in Madrid, Spain and Antioquia, Colombia.

The role of the agricultural engineer as a cultural editor in the longevity of a society: Agrobiotechnological experiences that have been obtained in some of the deserts and arid areas of the world

Edgar Omar Rueda Puente[1]*, Manuel Fortis-Hernández[2], Pablo Preciado-Rangel[2], Betzabe E. López-Corona[1], Dr. Jesús Ortega García[1], Carmen Lizette Del Toro Sánchez[1], Ramon Francisco Dorame Miranda[1], Jesús Sosa Castañeda[1], Susana Marlene Barrales Heredia[1], Guadalupe Amanda López Ahumada[1]

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The editor communicates, transforms and conceives a text as a finished product, organized according to technical needs and the market. Its purpose is the transmission of a cultural product that goes from authorial creation to the appropriation of the content by the reader. Agronomy as a branch of engineering covers three central aspects of agronomy: agriculture, livestock and technology. Within the wide range of activities that an agronomist carries out, in essence it is about improving agronomic production, managing its production and avoiding negative repercussions on the environment. This presentation will be focusing on the potential of halophytes for food, fodder and biofuels production, as well as their impacts on the environment and societies. Furthermore, to open new areas in production systems using novel technologies such as halophytes in a desert agriculture

Biography

Dr. Edgar O. Rueda Puente 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 (EMA: 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.

Organic agriculture as a strategy for sustaining ecosystem services and livelihoods in India

Organic farming has emerged in India as a sustainable alternative to traditional agriculture, emphasizing soil health and the production of nutritious food without synthetic fertilizers and pesticides. This study explores the broader implications of organic farming in India, focusing specifically on Sikkim state. Since the introduction of the National Programme for Organic Production (NPOP) in 2001, India has seen a consistent expansion of organic farming, with cultivated areas reaching 91.20 lakh hectares by 2021-22. This growth is driven by India's large population, with 85% of farmers managing less than 2 hectares of land. Organic product exports from India have shown remarkable growth, rising from €13.44 million in 2002 to €880.15 million in 2021, reflecting increasing demand, particularly from developed nations. India remains dedicated to meeting this rising demand, as evidenced by ongoing efforts in the organic export sector. Post-pandemic, India's organic food market has witnessed significant growth. A 2022 survey conducted across 187 countries practicing organic agriculture, by the Research Institute of Organic Agriculture (FiBL) and the International Federation of Organic Agriculture Movements (IFOAM), revealed that organic food cultivation in India spans 2.6 million hectares, ranking fifth globally. Additionally, the report highlighted that organic farming occupies 1.5% of total agricultural land, with India witnessing a 145.1% increase in organic agricultural land over the past decade. The Economic Survey 2022-2023 notes that India boasts the highest number of organic farmers globally, totaling 4.43 million.

The organic agriculture movement in Sikkim commenced in 2003 with a vision of sustainable livelihoods, environmental conservation, and widespread access to healthy food. The establishment of the Sikkim Organic Mission in 2010 and the State Policy on Organic Farming in 2014 underscored the state's commitment to organic agriculture. Today, Sikkim stands out as a national and global leader in organic farming, with comprehensive initiatives spanning sustainable farming practices, nutritious food production, value chain development, and market integration. The implementation of these initiatives involved collaboration with 14 Service Providers and 6 Certifying Agencies, bolstered by supportive policies such as "The Sikkim Agricultural, Horticultural Inputs and Livestock Policy." Key strategies focused on capacity building, input support, processing and value addition, branding, and marketing. Sikkim's agricultural landscape encompasses a diverse range of crops and plant species, including medicinal herbs, aromatic plants, and timber species, deeply rooted in traditional practices. To further advance agricultural development, Sikkim emphasizes sustainable practices and ecosystem services enhancement, particularly in forests. Integrating climate resilience into agricultural strategies is crucial for long-term

Ghanashyam Sharma

The Mountain Institute, India

Biography

Dr. Ghanashyam Sharma, Head of The Mountain Institute India, holds a Ph.D. in traditional agroforestry systems in the Indian Himalayas and completed a postdoctoral fellowship at the United Nations University in Tokyo, specializing in Sustainable Land Management. With over three decades of experience, he has made significant contributions to Mountain Ecology, Farming Systems, Watershed Management, Biodiversity Conservation, Climate Change, and Policy Development in the Himalayan region. Dr. Sharma has authored over 80 research papers in renowned high-impact factor journals and books, published over 30 peer-reviewed book chapters with international publishers, edited two books, and authored three more. He has presented his research in 51 international/global conferences, 24 national conferences, and 13 regional conferences and symposiums across 19 countries.

viability and environmental conservation. Sikkim's proactive approach to climate change, as outlined in its State Action Plan, demonstrates its commitment to sustainable development. Over the past 25 years, Sikkim has made remarkable strides in environmental security, notably achieving full organic status. The state's strategy for organic farming and entrepreneurship aligns with global standards while leveraging traditional farming wisdom. Legislative frameworks and policy initiatives provide a solid foundation for organic farming expansion. These efforts not only conserve genetic resources and agrobiodiversity but also unlock economic potential through value addition and market-oriented approaches.

Keywords: Organic Farming, Sikkim Organic Mission, Value Chain Development, Ecosystem Services, Eastern Himalaya.

Challenges in agriculture development in India

Agriculture sector in India has achieved many milestones such as being largest producers of milk, millets, pulses and jute and second largest producer of rice, wheat, sugarcane, cotton, fruits and vegetables in the world. However, low productivity is all pervasive. In this talk we focus on the factors that are contributing low productivity and challenges in addressing them. These challenges can be categorized into physical, technological, institutional and policy related. We present detailed analysis of these factors. Among the physical factors we observe that the size of the landholdings is decreasing over time making it difficult to mechanize fully and take advantage of economies of scale. Fresh water availability is also decreasing for irrigation due to improper management of water resources and increasing demand. There are also cases of desertification and soil erosion due to poor conservation practices. Technology use has suffered because of low literacy among farmers and small size of holding. Property rights of agricultural land has been poor as land disputes flood court cases which takes years to resolve. Both input and output markets are inefficient leading to high cost of marketing. Policy supports mostly addresses ad hoc concerns not the long-term problems. Poorly organized agriculture extension service is leading to poor practice son farm. These problems need a multipronged cohesive approach to address the deteriorating conditions of Indian agriculture.

Audience Take Away Notes

- The audience will be able to understand the dimensions of agricultural development and what policy initiatives are needed to address them
- This will help researcher and policy makers in the developing countries to analyze their own agriculture sector, identify weaknesses and suggest corrective actions
- The study gives practical solutions which may be useful in other countries' contexts. It will provide new information to assist in a design problem

Gopal Naik

Centre for Public Policy Indian Institute of Management Bangalore Bangalore, India

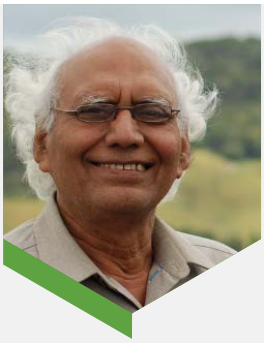
Biography

Gopal Naik is Jal Jeevan Mission Chair Professor at the Centre for Public Policy, Indian Institute of Management Bangalore. He completed Ph. D. in University of Illinois, USA and joined Centre for Management in Agriculture, Indian Institute of Management Ahmedabad, India in 1988. He has published extensively in refereed journals and has been a consultant to many international organizations. He works in the areas of agribusiness and agricultural policy and has been on several committees of Central and State Governments in India. He received Professional Excellence award in 2007 from The American Agricultural Economics Association.

Modern taxonomic assessments should be based on poly-trait diagnostic approach, rather than only on molecular investigations

Since the time of Carolus Linnaeus, the concepts of identification of a species appear to have changed drastically on account of enormous progress in modern DNA based technological advancements. Most modern research workers are mainly dependent on comparative phylogenetics, chiefly elucidating resemblances and differences among chloroplast genes or plastomes among plants belonging to same and different genera and they have reshuffled old concept of classification and identification. This is indisputably accepted that plastomes or chloroplast genes (so also mitochondrial genes) are the most deeply conserved DNA sequences in the evolutionary journey and have been too less amenable for mutational changes. This is because chloroplasts did evolve from an ancient cyanobacterial endosymbiont more than 1.5 billion years ago. During subsequent evolutionary phases with the evolving nuclear genome, the chloroplast genome has remained independent, strongly reduced, with its own transcriptional machinery and distinct features, such as chloroplast-specific innovations in gene expression etc (eg.post-transcriptional processing). Most research publications these days are exclusively based on rbcL gene-complex comparative assessments and are revising the identifications of species and regrouping various taxa.

The present author however, has been advocating "poly trait diagnostic Approach (ptdA)". Significant point here is that any one approach cannot decide the exactness within the biological system. We must have polygenic system investigation procedure and that too must be of different loci; for this we will have to simultaneously work on morphological, anatomical and chromosomal variations along with plastome genes. Morphological studies have included external and internal details of plant parts as well as specific efforts concentrated on light microscopic and SEM studies on spore morphology. Chromosome variations in shape and size along with their movement in cell divisions and pairing behaviour during meiosis have been very informative. All these features are under control of many genes. On the basis of above multidisciplinary approaches (including assay of many rbcL genes) we have discovered twelve new taxa among pteridophytes. All five species of Ophioglossu L, five species of Isoetes L discovered during 1968-2023 are those whose specific individual traits are unique and unknown among related genera and species. Among all discoveries, the taxon Isoetes pantii Goswami & Arya is a classic taxon in the plant kingdom; this species has X-Y chromosome mechanism, possesses heterosporangia (male and female spores within a sporangium), and explicitly demonstrates DNA sequences resembling some sequences of human Y chromosome. Southern blot and DNA blasting studies have confirmed the present author's earlier hypothesis that, ceaseless multiplications of DNA sequences since the time of origin



Hit Kishore Goswami

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Biography

Hit Kishore Goswami (born, 1942; M.Sc. in Botany ; Ph.D.1970) has served as a teacher in schools colleges and later joined University of Bhopal, founded the Department of Genetics and finally retired as Professor of Genetics from Barkatullah University, Bhopal in 2004. Having versatile teaching and research experiences he has published around 250 research papers, has lectured in more than 120 institutes and Universities in 18 countries. He has discovered twelve new plant species (five Isoetes and five Ophioglossum taxa; fossil gymnosperm genus, one cyanophyte). His publications on plants and Human cytogentics are cited world over in relevant journals and books.

of the cell, have been responsible for identical as well as random distribution of genes among trillions of cells before bisecting in to plant and animal cells sometime in the Early Cambrian. Identical to human Y chromosome MSY- DNA sequences have also been now known in the bryophyte Marchantia polymorpha.

Briefly, this presentation will also advise classical taxonomists and also molecular taxonomists that depending exclusively on one kind of investigation cannot be fully reliable for taxonomic inferences.

Audience Take Away Notes

- Young research students must understand that there is nothing absolutely 100% correct in Biology. Variation is a rule rather than exception. The same species may have different cytotypes or different species may have the same chromosome number. Therefore this presentation will help them to get trained in "poly trait diagnostic approach (ptdA). This includes that an investigator must identify a species not only by morphological similarities abut also care for anatomical, chromosomal behavior during cell divisions, chromosome types and numbers and electron and light microscopic studies on spores or pollen structural details of wall layers. As and when possible, phylogenetic relationships by the comparative assessments of rbcL genes (chloroplast genes/plastomes) should also be attempted. Following academic achievements are possible:
- Young students should get proper training on atleast three specialized areas
- Chances of getting a job as research scholars and or faculty at any institute will increase for those who practice on several disciplines in order to investigate on any plant species
- Outcome of ptdA investigations will be more authentic
- Not only publications but recognition of the published work as well as of investigators is equally important in science

Role of agricultural areas for preservation of mammalian diversity

The significant problem between agriculture and mammals is the conflict over resources and land use. This conflict manifests in various ways, including crop damages caused by many species, predation on livestock by carnivores, and the transmission of pathogens affecting humans and livestock. Land fragmentation, habitat loss or degradation, and the use of pesticides are the main issues affecting all wildlife in agricultural areas, particularly mammalian diversity. We will discuss the importance of agricultural habitats for maintaining mammal diversity, using long-term research data from Lithuania as a case study and comparing it with other countries. The surveys used a variety of methodologies-observation and daily activity recording, wildlife cameras, trapping of small mammals, dietary analysis by isotope analysis, and detection of vector-borne pathogens. The report is mainly based on an analysis of published material. The period covered is from 1980 to 2024. For ungulates, the anthropogenic nature of the landscape has been shown to be a prerequisite for their high densities, primarily due to the abundant supplementary fodder available in the fields throughout the year. As a result, some species, such as wild boar, roe deer, red deer and European bison, are changing their diet. Orchards, berry groves and commensal habitats support most of the country's small mammal species, although insectivores (shrews) are rare here. Adaptation of mammals to agro-habitats requires behavioural and diurnal polychaetes in larger mammals, and is linked to nutritional traits in small mammals. We will compare the diversity of mammals in agro-habitats and other habitats, such as forest, grassland and cities. Finally, we will look at improving the capacity of agricultural land to support mammal populations through a range of strategies to enhance habitat quality, reduce human-wildlife conflicts and promote coexistence. These strategies include habitat restoration and enhancement, wildlife-friendly farming practices, sustainable land use planning, education and participation programmes.

Audience Take Away Notes

- The theoretical aspects of the interaction between agroecosystems and biodiversity are crucial for reconciling agricultural development and nature conservation
- The material presented is suitable for teaching purposes and audiences, and broadens the understanding of interactions between agroecosystems and mammals

Linas Balčiauskas*, Vitalijus Stirkė, Laima Balčiauskienė

Laboratory of Mammalian Ecology, Nature Research Centre, Vilnius, Lithuania

Biography

Linas Balčiauskas is a leading Lithuanian mammalogist at the Nature Research Centre in Vilnius. Over the course of his career, he has authored more than 80 research articles in SCI(E) journals and approximately 200 in other peer-reviewed publications, delivered over 200 presentations at conferences and leaded over 50 commissioned research and experimental development projects. His research interests encompass various aspects of mammalian ecology, human dimensions of mammals, and citizen science. Linas also serves as an expert in several IUCN specialist groups, mentors doctoral students, and actively participates in the editorial processes of several scientific journals.

Study on optimization of spray parameters of drone mounted sprayer

The application of drones have now become immensely important in various fields of agriculture and allied sectors. Recently, multi-rotor drones have become one of the dominant approaches, especially for spraying operations. Researchers and manufacturers have been quite interested in the performance of drone mounted sprayer. This study aimed to developed six-rotor battery-powered drone mounted sprayer, which was used to assess the performance in laboratory condition at University of Agricultural Sciences, Raichur, Karnataka to assess the drone mounted sprayer operational parameters viz., discharge rate, operating pressure, height of spray, spray swath width, spray angle, uniformity of the spray distribution. The findings shows that, the more round spray droplet vertex pattern was generated during the 2.0m hover height compared to the 1.0m hover heights due to the direct impact of downward airflow generated by the rotors. It was concluded that, the good spray volume distribution was found at 1.0m height of spray. The optimized operational parameters under laboratory conditions such as height of spray, operating pressure, swath width, discharge rate, spray uniformity and spray liquid loss were found to be 1000 mm, 1.37 kg cm-2, 2987 mm, 1545 ml min-1, 98.7 and 3.88 per cent respectively. The spray uniformity increased with increase in height of spray and operating pressure. Spray uniformity was minimum in case of lower operating pressure because of the droplet size. The VMD and NMD of spray droplet were measured and found to be 345 and 270 µm, respectively in lab condition. The average droplet density was measured and it was found to be 17 No.s cm-2.The application rate of drone mounted sprayer was calculated by considering the optimized average values of output rate, forward speed and effective spray width were 1.5 L/min, 10.8 km/h and 2.1 meter, respectively. The average application rate was found as 40 l/ha. The study provides references for researchers and drone operator to operate drone sprayer with optimised spray operational parameters in actual field condition.

Keywords: Drone Sprayer, Droplet Size, Discharge Rate, Spray Patternator, Sprayuniformity, Height of Spray.

M. Veerangouda[1]*,Yallappa D[2], Vijayakumar Palled[3], Devanand Maski[4]

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Biography

Dr. M. Veerangouda, presently working as Registrar of the University of Agricultural Sciences, Raichur. He has completed his Master's and Doctoral Degree from TNAU, Coimbatore with a specialization in the field of Farm Power and Machinery. He has rich experience of more than thirty two years of service in the college and in the field of agricultural engineering and specifically in the field of farm machinery and power engineering. He has served under different capacities right from assistant professor, associate professor, professor, head of the department and also the dean of the college. He has served as Head of the department for more than ten years in the Farm Machinery and Power Engineering including the university level headship. He has guided more than twenty masters and eight doctoral students under his chairmanship. He has handled more than twenty research projects which have been funded by ICAR, GoI, GoK and also Institutional. There are more than thirty five technologies developed and popularized under his leadership and collaborative projects. He has more than hundred publications which comprise of research papers and abstracts published in reputed national and international journals, research and technical bulletins, popular articles, extension literatures etc. He has also been conferred with a number of national and international awards for the contributions in the field of farm machinery and power engineering. He is also a member of the different professional bodies like, The Institution of Engineers (India), The Indian Society of Agricultural Engineers, Karnataka Agricultural Engineers Association etc.

Crucial role of fungi in environmentally sustainable agriculture

To produce more, better and safer food we must be able to do so while promoting the sustainable use of agricultural resources. The increase in agricultural production is currently through the use of pesticides, fertilizers, and developments in plant breeding and genetic skills. In the naturally existing ecology, rhizospheric soils have biological living beings to favor the plant development, nutrient assimilation, stress tolerance, disease deterrence, carbon seizing and others. These organisms include mycorrhizal fungi, bacteria, actinomycetes, etc. which solubilize nutrients and assist the plants in up taking by roots. Amongst them, vesicular arbuscular mycorrhizal fungi have key importance in natural ecosystem, but high rate of chemical fertilizer in agricultural fields is diminishing its importance. The majority of the terrestrial plants form association with Arbuscular Mycorrhizal Fungi (AMF). This symbiosis confers benefits directly to the host plant's growth and development through the acquisition of Phosphorus (P) and other mineral nutrients from the soil by the AMF. They may also enhance the protection of plants against pathogens and increases the plant diversity. Proper management of AMF has the potential to improve the profitability and sustainability of agricultural systems. With greater interests and a consensus on the need to promote sustainable development, mycorrhiza fungi have an important role to play in reducing the harmful effects of agricultural inputs like fertilizers for improving plant growth, and pesticides, fungicides, insecticides in controlling several diseases. It is a cost-effective and non-destructive means of achieving high productivity leading to establishment of a viable, low-input farming system. Integrating AMF into agricultural practices will promote environmentally sustainable agriculture.

Audience Take Away Notes

- Mycorrhizal relationships are as old as plants and have been shaping the earth for millions of years but since the 20th century agriculture practices have almost destruct the underground communities. Mycorrhiza fungi have an important role to play in reducing the harmful effects of agricultural inputs
- We all must realize the importance of mycorrhizal associations in the maintenance of the health of the soil
- Mycorrhiza fungi have a main role in the adaptation to the worsening climate emergency

Nelida Lucia Del Mastro

Centre of Radiation Technology, IPEN/CNEN, Sao Paulo, Brazil

Biography

Dr. Nelida Lucia del Mastro studied Chemistry at the Buenos Aires University, Argentina and got a MSc at the University of Sao Paulo (USP), Brazil. She then joined the Institute of Energy and Nuclear Researches (IPEN/CNEN) working in biological radiation effects. She received her PhD degree in 1983 in Biochemistry at the USP. At present she is senior researcher and consultant on radiation applications on Agriculture, Foods and Public Health. She has published more than 70 research articles in SCi journals.

Mind the gaps between innovation and impact: Critical research to validate product claims for the future of a productive, nutritious, and globally sustainable food system

There exists a gap between basic research led by the academic sector and commercialization of technology led by the industry sector. Biotechnology Industry, particularly plant biotechnology, is skilled in bringing new products to end-users. As a result, there are numerous agricultural products in the market, and each product claims to be superior to all the other products in performance – but how do we know that is true? The majority of small to mid-scale agricultural marketplace (globally) is driven through marketing capabilities rather than actual product efficacy or sustainability. Some of these products are significantly better and have the potential to reduce the need for synthetic inputs, improve food quality and farmer income. Better performing products may eventually stay longer in the market, but most of the product claims are exaggerated, which inevitably fail in broad-acre applications, causing severe loss-of-income for farmers and undesired environmental consequences. It is difficult to regulate product claims, leaving a gap in the industry. On the other hand, high level basic research capabilities exist in institutes and universities, but it is largely out of reach for commercial product verification and peer-reviewed publication. This gap is further exaggerated by the necessity for boundaries between industry and public-funded research. A new model to bridge the research gap between the two sectors will be presented. Developed and established in the past five years, it allows industry access to independent research for product verification and provides a unique platform for technology transfer from academia to market. Examples will be shared on mode-of-action research (with commercialized products), and on technology transfer (with new inventions). The need for implementing a new independent research paradigm is urgent to identify beneficial technologies methodologically for building actionable portfolios to overcome pressures on plant performance, like disease and drought stress, and improve nutrition and productivity in broad growing systems. This is an essential step for achieving positive impact on society, local and global economies, and collectively on our planet for generations to come.

Rajnish Khanna

Department of Plant Biology, Carnegie Institution for Science, Stanford, CA, USA

Research and Development, i-Cultiver, Inc., Manteca, CA, USA

Biography

Rajnish Khanna, M.Sc. Ph.D., is a Senior Investigator at Plant Biology, Carnegie Institution for Science, Stanford. Rajnish is the founder and CEO of i-Cultiver, Inc., Terre Local, and co-founder and Executive Director of "Urban Green Project". He is a strategic biotechnology consultant applying multidisciplinary approaches for research and development. Known for empowering the industry through strategic partnerships with academic institutions, facilitating technology transfer into real world applications, and deploying advanced technologies at global scale for agro-eco projects. Rajnish is the host of TerreScience podcast/YouTube channel focused on soil and planetary health.

Audience Take Away Notes

- The audience will learn how to establish productive research partnerships across sectors
- How to expand capabilities and expertise through cross sector networking
- Academic faculty, students and postdocs will benefit from new potential resources
- This provides an actionable solution to upgrade food production, consumer education and health, through a new design for agricultural impact

- It will fill a research gap that exists in the food systems by redesigning the ability and advantage of independent verification and validation of product claims
- Early-stage scientists will have new professional opportunities
- It will bring more accountability in the food system with the capability of optimization for maximum benefits and yields
- Mode-of-action research with current products will lead to new discoveries and interventions for improving agricultural success
- It will build new pathways between industry and academia towards a more collaborative impact on society

A model-based optimization framework for multi-year allocation of land and water

Due to increasing food demand and water scarcity, the planning and management of agricultural land is one of the major challenges the world is currently facing. In my talk I will discuss how Crop Growth Models can be used for multi-year planning of land and irrigation water allocation. I will start with a brief overview of Crop Growth Models and outline how they can be used to estimate crop Water Productivity Functions that are both location and climate dependent. I will then describe in details how this information can be used to formulate the land and water allocation problem as an optimization problem that can be solved using well-established optimization algorithms. I will discuss how the proposed framework compares to existing approaches, and in particular: (1) the proposed framework does not produce a single "optimal" plan but rather provides the user with a list of "good" plans from which the user can chose his/her preferred plan taking into account factors that were not included in the original analysis (such as for instance year-to-year fluctuations of profit or water use); (2) the proposed framework takes into account the need to rotate crops according to specific agronomic patterns, which ensures that the recommended multi-year plan is indeed acceptable from an agronomic stand-point. I will conclude my presentation by outlining various extensions that could be readily added to this framework, such as taking into account the impact of climate change or including a feedback mechanism whereby crop market value is affected by production.

Raphael Linker

Faculty of Civil and Environmental Engineering, Technion–Israel Institute of Technology, Haifa, Israel

Biography

Raphael Linker is Professor at the Faculty of Civil and Environmental Engineering at the Technion-Israel Institute of Technology. He received a degree in electro-mechanical engineering from Brussels University (Belgium) and MSc and PhD degrees from the Faculty of Agricultural Engineering at the Technion. His main research interests are related to the use of advanced approaches for sensing, control and optimization of agricultural and environmental systems. He has supervised over 40 graduate students and has co-authored over 90 peer-reviewed publications.

Empowering indigenous communities through agro-entrepreneurship training in millet-mushroom food innovations for nutrition and socio-economic development

In Bangladesh, a big number of indigenous peoples, who mainly lives in hilly areas are deprived of many facilities including, education, health-care facility, market access etc. which render them to suffer from malnutrition and subsistence living standard. This research focused on the nutritional status of great millets (*Sorghum bicolor*) and oyster mushrooms (*Pleurotus ostreatus*), exploring their health benefits, food innovations, and potential for agro-entrepreneurship in addressing the socio-economic challenges, malnutrition, and subsistence living conditions among indigenous communities in Bangladesh. Millets are known for their high nutritional value, rich in fiber, protein, vitamins, and minerals, which offer numerous health benefits including improved digestion, weight management, and reduced risk of chronic diseases such as diabetes and heart disease. While mushrooms are renowned for their protein content, essential amino acids, and medicinal properties, which contribute to immune support, cardiovascular health, and cancer prevention. By infusing mushroom powder with millets, a range of nutritious ready-to-eat foods such as dosa, chapati, adli, roti, paratha etc., and ready-to-cook food items e.g., nodules, pagati, pasta etc. can be developed, leveraging the diverse culinary traditions highlighted in Indian cuisine. Through gender-inclusive training in agro-entrepreneurship, indigenous communities can harness these resources to create sustainable food products, develop SMEs with the prepared food items, and promoting both economic empowerment and improved nutrition. Millet and mushroom can easily be grown in the hilly land with low cost and cares. This research underscores the potential of millet-mushroom food innovations not only in enhancing dietary diversity and addressing malnutrition but also in fostering socio-economic development and resilience among marginalized communities in any other developing countries.

Audience Take Away Notes

- The audience can get insights of socio-economic conditions of indigenous peoples and the reasons behind it. The innovative food development from the nutritious millets and mushrooms will open their knowledge and concepts of new SMEs
- Other people can replicate or expand the research concept and fit in local conditions especially for the indigenous communities
- This research underscores the potential of millet-mushroom food innovations not only in enhancing dietary diversity and addressing malnutrition but also in fostering socio-economic development and resilience among marginalized communities in any country

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Biography

Professor Dr. S. M. Rezaul Karim is an Agronomist having teaching and research experience of more than 35 years. Recently he has obtained experience in food science from Universiti Putra Malaysia. Prof. Karim obtained his M. Sc. Ag in Agronomy from Bangladesh Agricultural University (BAU), Mymensingh in 1981, M. Phil from University of Reading, England, UK in 1991, PhD from University of Aberdeen, Scotland, UK in 1999. He is an author of five books of Weed Science and three book chapters in the same discipline. He has published more than 117 papers in reputed journals. Prof. Karim joined Universiti Putra Malaysia as IOI Chair on 12 November 2021.

Impact of climate change on insect pests

Climate change and global warming are of great concern to agriculture worldwide and are among the most discussed issues in today's society. Climate parameters such as increased temperatures, rising atmospheric CO2 levels, and changing precipitation patterns have significant impacts on agricultural production and on agricultural insect pests. Changes in climate can affect insect pests in several ways. They can result in an expansion of their geographic distribution, increased survival during overwintering, increased number of generations, altered synchrony between plants and pests, altered interspecific interaction, increased risk of invasion by migratory pests, increased incidence of insect-transmitted plant diseases, and reduced effectiveness of biological control, especially natural enemies. As a result, there is a serious risk of crop economic losses, as well as a challenge to human food security. As a major driver of pest population dynamics, climate change will require adaptive management strategies to deal with the changing status of pests. Several priorities can be identified for future research on the effects of climatic changes on agricultural insect pests. These include modified integrated pest management tactics, monitoring climate and pest populations, and the use of modelling prediction tools.

Keywords: Climate Change, Global Warming, Food Security, Agriculture, Insect Pests.

Shashi Vemuri

Professor Jayashankar Telangana State Agricultural University, India

Biography

Prof. Shashi Vemuri had Ph.D in agricultural Entomology with specialization in Insect Toxicology and Pesticide Residues, was Formerly Senior Professor/ and university head of entomology at PJTSAU with more than 38 years experience in different capacities as Professor/ Researcher and Extension scientist, Administrator, Head of the Research Centres and Extension Centres. He participated in various international and National conferences, workshops and has excellent links with many ICAR and State Universities, Universities abroad and leading MNCs. He is a globally travelled Agricultural professional and has strong professional relationships with policy makers, Administrators, farmers organizations and Agribusiness sector with a thorough understanding of the complex socio-economic, political, cultural and environmental aspects of Agriculture in India and other major agrarian economies across the world.. He was a Guide, advisor, mentor for many budding agricultural scientists. His contribution to crop protection, pesticide residues, insect toxicology and innovative methods of farming are widely recognized. He has worked for and with CIMMYT, Mexico on breeding for Insect Resistance. Worked with ICAR, SAU, WWF International ICRISAT, Major farmers organizations and federations as a Collaborator, contributor and Researcher and with the farmers on innovative technologies in sugarcane, Potato, Ginger and Turmeric.

Low-temperature atmospheric pressure plasma: An emerging green technology for improving agricultural productivity

The grand challenge of feeding nearly 10 billion people by 2050 requires that agriculture overcome several destabilizing factors, including the most challenging climate-change occurrences, to food and water security. Agricultural production must innovate environmentally friendly green technologies to improve crop productivity and ensure the sustainable production of nutrient-rich and disease-free foods during the climate change era. Low-Temperature Plasma (LTP) is a partially ionized gas with unbound electrons, ions, neutral particles, reactive nitrogen species, reactive oxygen species, and ultraviolet light. Low-temperature plasma is emerging as a viable non- chemical tool for seed priming to break seed dormancy, hasten seed germination, improve crop productivity, and disinfect seeds and foods, among many other uses. This research assessed LTP for (1) utilization for improving crop productivity through early seed germination, crop growth, drought tolerance, and biomass production using microgreen crops and mustard greens and (2) ensuring food safety by eliminating seed-borne pathogens. (i) Improving crop productivity using LTP: The mustard greens seeds were exposed to Argon (Ar) or Helium (He) gas LTP (at a fixed power setting of 6 kV, 1 µs pulse width, and 6 kHz) for T0=0 s (Control), T1=30 s, T2=60 s, and T3=90 s. The treated seeds were grown in pots containing potting mix at two seeds/pot and placed in a greenhouse. Seed germination, germination rate, plant height, and root length were recorded. Ar or He LTP increased the total seed germination by an average of 25% over the Control; the seedling height of Ar or He LTP-treated seedlings was, on average, 40% taller than that of the Control; fresh seedling biomass was double that of the Control in He LTP-treated seeds, and Ar LTP 30 s treatment, increased the root length by nearly 17% over that of Control. Faster seedling growth without compromising seedling biomass and an increase in root length indicate improved drought tolerance through shorter crop growing duration and increased root length for exploring larger soil volume for moisture and nutrients during drought stress. ii) Controlling seed-borne pathogens using LTP: Stemphyllum botryosum on spinach and Xanthomonas campestris Var. vesicatoria on bell pepper: This study assessed the effectiveness of low- temperature plasma in suppressing the seed-borne fungus S. botryosum and bacterium Xanthomonas Campestris pv. Vesicatoria (Xcv), cultures obtained from the American Type Culture Collection. The cultures were grown in the lab aseptically on nutrient agar and broth. The S. botryosum was directly treated with or without LTP, and Xcv cells were treated with argon gas LTP at 6kV and 8kV with a flow rate of 1.41 each at 4, 6, and 8 minutes. The mycelial growth was reduced by >50%, and LTP inhibited conidia formation. The SEM analysis showed that X. campestris cells were more

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Biography

Dr. Srinivasa Rao Mentreddy, an Indian-born American citizen, is a Professor of crop science at Alabama A&M University, Alabama, USA. His research focuses on developing cover crop-based sustainable crop production practices for vegetable and medicinal herbs in the open field and agroforestry systems, evaluating low-temperature plasma for ensuring food safety and improving crop productivity, and climate-smart agricultural practices using cover crops and alley cropping. Dr. Mentreddy earned a BS and MS in Agriculture from the Andhra Pradesh Agricultural University, India, and a Ph.D. in Agronomy from the University of Tasmania, Australia. Dr. Mentreddy is well-published,

unified in small rod shapes in the Control. In contrast, the LTP- treated bacterial cells became curvier, swollen, and aggregated, and destruction of cell walls in some bacterial cells. This research was supported by NSF EPSCoR RII Track 1 Grants OIA–1655280 and 2148653 and NASA EPSCoR 80NCCS21M0139.

Audience Take Away Notes

- This presentation provides the audience with a research-based proof of concept of an emerging environmentally friendly, chemical-free technology for ensuring early seed germination and uniform plant establishment, improving plant growth and yields, and controlling seed-borne diseases
- The audience could initiate this research to improve different agricultural and horticultural crops
- Use the technology to train students in technology-based innovative agriculture to solve food problems
- This technology has the potential to generate liquid nitrogen that can be applied to crops through fertigation
- Integrate this technology to develop chemical-free control of plant diseases and improve the storage life of perishable foods, including fruits and vegetables
- This is an emerging technology with potential for a myriad of applications in agriculture

with about 48 peer-reviewed journal articles, five book chapters, and more than 196 conference proceedings abstracts.

Importance of plant science and molecular biology for the sustainable seed-cotton (or kapas) development

Organic seed-cotton (or kapas) is the seed-cotton (or kapas) grown without using synthetic chemicals either as pesticides or as growth promotors, there by supporting plant science, molecular biology, bio-diversity and bio-geo- chemical cycles.

Genetically modified seed-cotton is not sustainable seed-cotton. This kind of seed-cotton is cultivated using lower levels of pesticides and fertilizers; however, it is not completely free from them. Organic cotton does not use genetic modification, chemical pesticides or fertilizers.

Helicoverpa armigera, commonly known as American cotton bollworm, is a pest that causes boll worm diseases which is a serious damage to seed-cotton (or kapas) crops. Extensive use of chemical insecticides, such as pyrethroid and organophosphates, has led to the development of resistance against these chemicals in H. armigera.

Pectinophoro gossypiella, is commonly known as Pink Bollworms and bud worm.

India has adopted Bt seed-cotton (Bt Kapas) in the year 2001, which is grown in almost 90% of its total cotton area. Bt Cotton is the seed-cotton (or Kapas) that is seed-cotton crop which a kind of plant duly modified genetical seed-cotton. The toxicity produced by the bacterium Bacillus thuringiensis (Bt) that is the gene production pesticide added in to the genome of the cotton. Bt Toxin which acts as a pesticide or insecticide for the insects destroying the seed-cotton crops. The insect resistant genetically modified seed- cotton was designed and developed from the soil bacterium Bacillus thuringiensis in such away enables to produces Bt Protein and kills Heliothis (cotton bollworm) responsible for eating the seed-cotton leaves. Bt Gene protects the cotton plants from bollworm and bud worms which are major pest of seed-cotton as the bollworms present on the leaves become lethargic and sleepy and thus cause less damage to the seed-cotton plants. Bacterium Bacillus thuringiensis (Bt) is a bacterium that is not toxic to humans or other mammals but is toxic to certain insects when ingested as it is important consideration for the growth of the seed-cotton (or kapas) plant science and molecular biology. Bt works as an insecticide by producing crystal shaped toxic protein that specifically kills certain insects and protects transgenic seed-cotton crops. As the Bt Toxin gene is cloned from bacteria as it provides insects' resistance, the need for decreasing traditional insecticides which results in less soil pollution from these non-biodegradable chemicals. This causes swelling and lysis for the bud and bollworm insects's death. The Bt.cotton growth rate and sustainability of pesticide reductions have been considered in this research paper. The genetically modified seed-cotton in India, have considerably reduced chemical insecticides usage by 38% while increasing seed-cotton productivity by 22% and increasing

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Biography

Dr. Vijayan Gurumurthy Iyer studied Environmental Science and Engineering at the Indian School of Mines, (Presently: Indian Institute of Technology), Dhanbad, India and post graduated and doctorate as M.Tech. and Ph.D in 1998 and 2003 respectively. He then joined Post Doctoral Fellow (PDF) in World Scientific and Engineering Academy and Society (WSEAS), Athens, Greece of Prof. Nikos Mastorakis. He has elaborated PDF in 2010 in the same institution. He received his D.Sc. (Engg.) and LL. D degrees in 2010 and 2011 at the Yorker International University respectively. He received his DL degree 2011 at the International Biographical Centre (IBC), Cambridge, Great Britain. He has published more than 460 research articles in peer-reviewed journals and conference proceedings. He has more than 5000 citations and 500 citation index databases. His h.index is 60. He has more than 130 multilingual eBooks published in his credit.

farmer profitability by 70%. The usage of pesticide has considerably reduced by using Bt Technology for sustainable cotton development.

The regular seed-cotton is in the textile manufacturing process. Regular seed-cotton come from the genetically modified seed-cotton. The genetically modified seed-cotton provides resistant to three kinds boll worms such as American seed-cotton bollworms and pink boll worms, UK bollworms.

Helicoverpa armigera, commonly known as American cotton bollworm, is a pest that causes serious damage to cotton crops. Extensive use of chemical insecticides, such as pyrethroid and organophosphates, has led to the development of resistance against these chemicals in H. armigera.

The emerging pest of seed-cotton (or kapas) is called Helopeltis bradyi (water house) as major pest in interspecific Bt seed-cotton which has the history of causing cent percent damage and yield loss to seed-cotton due to boll worm diseases. The Helicoverpa gelotopoeon as also major pest that causes reducing productivity. Regular seed-cotton comes from Genetically Modified Seed-Cotton (GMS). GMS that modifies in order to resist bugs and more pesticides are required when bugs become stronger and more resilient.,

The seed-cotton bollworm can cause quality, productivity and yield sustainability losses of 67% due to boll worm diseases caused by American boll worms, UK bollworms, pink boll worms resulting damages to crops and lint cotton. Therefore, effective and efficient product and process management must be required for sustainable seed-cotton development.

It is further concluded that natural seeds are to be designed and developed to produce organic seed-cotton and organic colour seed-cotton as it is considered important for the sustainable plant science and molecular biology.

Pesticides, insecticides, genetically modified seed-cotton and other harmful chemicals are not to be used in cultivating seed-cotton (or kapas). Organic seed-cotton is generally less environmentally destructive than conventional seed-cotton as organic seed-cotton does not use any pesticides, insecticides, bollworm and bud worm resistant seed-cotton, transgenic seed-cotton. Conventional seed-cotton are manufactured for meeting industrial requirements and conventional seed-cotton growing methods, and environmentally unsustainable methods.

Sustainable seed-cotton is inclusive of organically produced seed-cotton due to the beneficial requirements in organic cultivation practices. It is concluded that the sustainable seed-cotton production using sustainable organic practices including organic seed-cotton and naturally pigmented colour seed-cotton must be on the rise as it is important consideration of seed-cotton(or kapas) plant science and molecular biology for the sustainable seed-cotton (or kapas) development.

Keywords: Artificial, Kapas, Lint-Cotton, Natural, Productivity, Quality, Seed-Cotton, Sustainability.

Audience Take Away Notes

- The conceptual approach of the product and process and combined growth management of seed-cotton (or kapas) sustainable technology
- Sustainable seed-cotton technological development
- The research work provides practical solution to the present seed-cotton technological problem
- The paper will improve the reliability, timeliness and accuracy of seed-cotton design, or provide new information to assist in a seed-cotton design and development problem

Importance of Environmental Impact Assessment (EIA) process for agricultural and horticultural projects, plans, programs, policies and legislative actions towards sustainable development

In this article Environmental Impact Assessment (EIA) process for agricultural and horticultural projects, plans, programs, policies, legislative actions towards sustainable development with field EIA reports. The entrepreneurship development through green economic model for sustainable entrepreneurship is designed and developed for efficient and effective solid and hazardous waste management prior to Environmental Impact Assessment (EIA) process conducted for two modern rice processing mills (Figures 1 and 2). The Resource Conservation and Recovery (RCRs) and EIAs are designed and developed to protect the environment during the post COVID-19 World. Strategic Environmental Assessment (SEA) process can be broadly defined as a study of the impacts of a proposed project, plan, project, policy or legislative action on the environment and sustainability. The root cause problem solution for Ozone Layer Depletion Potential (OLP) impact, Global Warming Potential (GWP) impact and Green House Synergic (augmentative) Gas (GHG) emission impacts of 57 Giga tons of Carbon dioxide equivalent in context to generic, source specific and industrial specific plants are measured, monitored and mitigated by international environmental impact assessment process for the sustainable environmental climate change and control. In this research, SEA process has been aimed in order to incorporate environmental and sustainability factors in to agricultural and horticultural Project Planning and Decision Making (PPDM) process such as project formulation and appraisal that included policies, programs, plans and legislative actions. Sustainable entrepreneurial agricultural and horticultural development is a kind of development that meets the needs of the present without compromising the ability and efficacy of future generations to meet their own needs. Environmental Impact Assessment (EIA) process can be defined as the systematic study and check of the potential impacts (effects) of proposed projects, plans, programs, policies or legislative actions relative to the physical-chemical, biological, bio-physical, radio-active and cultural, and socioeconomic components of the total environment. The primary purpose of the EIA process is to encourage the consideration of the environment in organizational project planning and decision-making process and to arrive at actions that are environmentally compatible. PPDM process should include the integrated consideration of technical or engineering, economic, environmental, safety, and health, social and sustainability factors to achieve business excellence. The objective of the study is to conceptualize and develop SEA process for the climate change and environmental pollution control and a course module is developed entitled “BIPARD training and research course module-8”

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Biography

Dr. Vijayan Gurumurthy Iyer studied Environmental Chemistry at the Indian School of Mines, Dhanbad and graduated as M.Tech. in 1998. He then joined as Professor in Environmental Science and Engineering at the Institute of Technology, Haramaya University, Ethiopia. He received his Ph.D in climate change degree in 2003 at the same institution. After two years, he completed postdoctoral fellowship supervised by Prof. Nikos E Mastorakis, World Scientific Engineering Academy and Society, WSEAS. He obtained the position of a faculty in Bihar Institute of Public Administration & Rural Development (BIPARD). He has published more than 460 research articles in SCI(E) journals and conference proceedings. He has considerable citations and citational indices in credit. His h.index is 60.

on environmental pollution, climate change, afforestation and global warming control. The design of the study is cross sectional. Environmental Health Impact Assessment (EHIA) process has been conducted for a generic nuclear power plant to consider the environmental quality, safety and health impacts to mitigate psychological health effects on workers and nearby residents. Social Impact Assessment (SIA) process can be defined as the systematic identification and evaluation of the potential social impacts (effects) of proposed projects, plans, programs, or legislative actions such that social consideration is encouraged in process and to arrive at actions that are socially compatible with reference to a sustainable sanitation project. SEA process concerns to environment and sustainability effects in process and arrive at proposed projects, plans, programs, and legislative actions that are compatible with respect to environment and sustainability issues.

Photograph 1: Environmental Impact Assessment (EIA) Conducted on 06.01.2023.

National Cooperative Consumers Federation of India Limited–Intermediary- Hulling Agent M/S Ravi Modern Rice Mill,

No.198, Vellore Road, No.22, Sirukaveripakkam, Kanchipuram, 631 502.

International EIA process required multi-disciplinary approach that has been conducted for certain agricultural and horticultural projects. The paper highlights SEA process conducted for certain projects that based on operation and process approach and associated studies for sustainable development. Engineering hybrid Lifecycle Analysis (LCA) has been conducted for identifying and measuring the impact. LCA considers the activities related to raw materials, transformation, ancillary materials, equipment, method, market, man power, production, use, disposal and ancillary equipment. As far as generic, source specific and industrial safety is concerned Personal Protective Equipment and Materials (PPEMs) that include garments, clothing, gloves, safety shoes, hard hats, safety glasses, shields, respirators, full aprons, safety belts, and other safety items which have to be used by an individual. Such equipment is important for personal protection and for safety.

Photograph 2: Environmental Impact Assessment (EIA) Conducted on 06.01.2023.

M/S Sri Vinayaga Modern Rice Mill, # 106/ 4 A, Ammankulam Street, Kanchipuram 631501.

It is the manager's and supervisor's responsibility to ensure that they are used. The enactment of worker's compensation law and occupational disease law shall increase materially the cost of insurance to industry. The increased cost and the certainty with which it is applied will put a premium on accident-prevention work. This cost can be materially reduced by the installation of safety devices. RCR research experience has shown that approximately 90% of all the generic, source specific and industrial accidents are preventable. EIA and EHIA processes have been conducted for a nuclear power plant to consider the safety and health impacts to mitigate psychological health loadings on workers and nearby residents. SEA system is a potentially useful element of good environmental management and sustainable development; however, as currently practiced in generic, source specific and industries, it is far from perfection. Emphasis should be given in generic, source specific and industries on maintaining economic viability of the operation, while in turn taking care to preserve the ecological and social sustainability's of the country. International EIA process required multi-disciplinary approach that has been conducted very early stage of agricultural and horticultural projects for technical, economic, ecological and social sustainability.

Keywords: Agriculture, Conservation, Resource, Recovery, Education, Embed, Entrepreneurship Horticulture, Environment, Generic Quality, Industry, Management, Source, Sustainability.

Audience Take Away Notes

- The audience will be able to create environmentally friendly sustainable agricultural and horticultural rural and urban development projects, plans, programs, polices and legislative actions
- Agriculture and horticultural new projects, plans, polices, plans, legislative actions
- The research proposal provides practical solution to a sustainable environmental pollution problem
- It provides designer's job more efficient. It will improve the accuracy, reliability and timeliness of agricultural and horticultural new designs
- Sustainable industrial, generic and source specific developmental projects

BOOK OF ABSTRACTS

SEPT

16-18

9th Edition of Global Conference on

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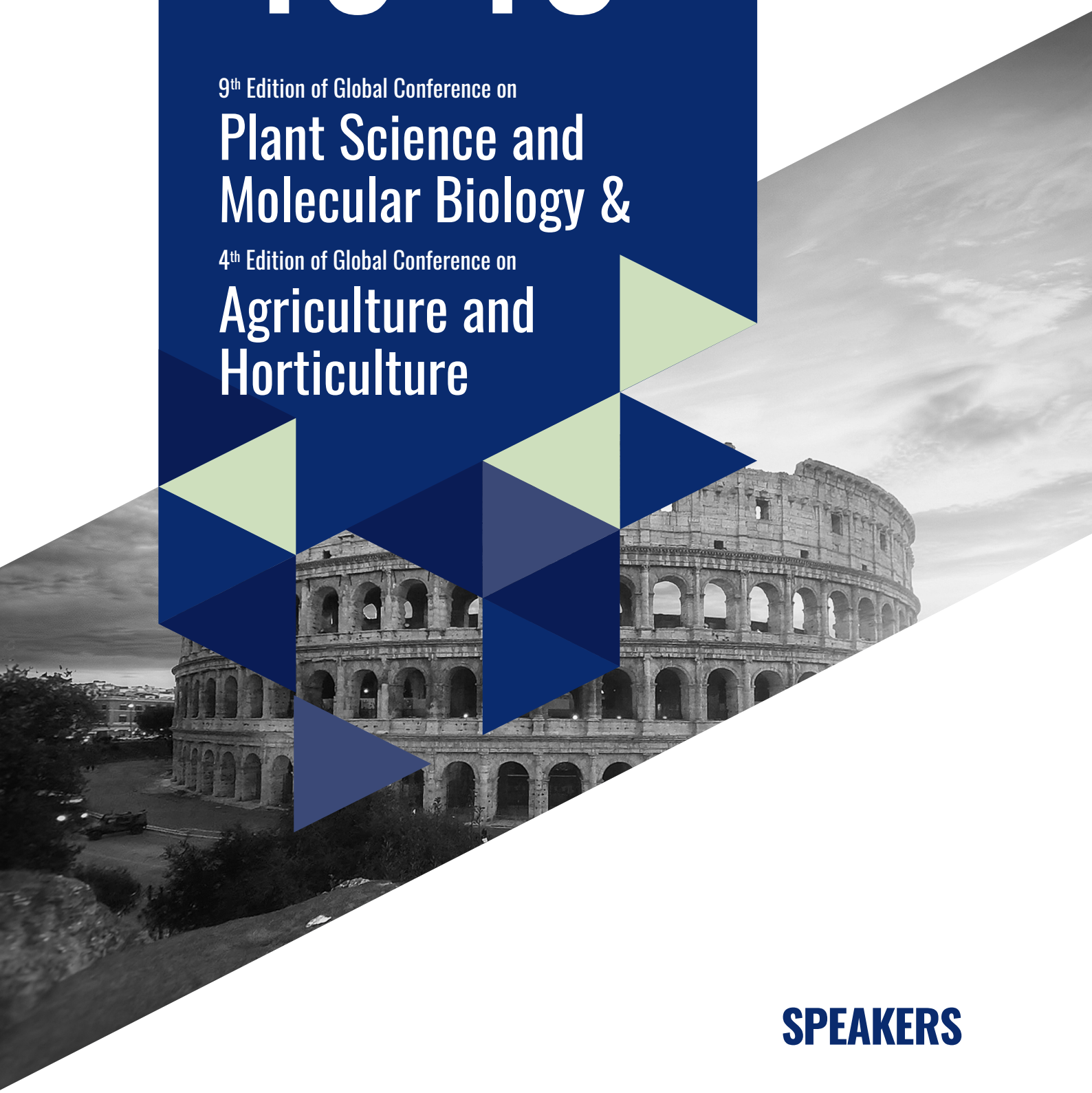
Agriculture and Horticulture



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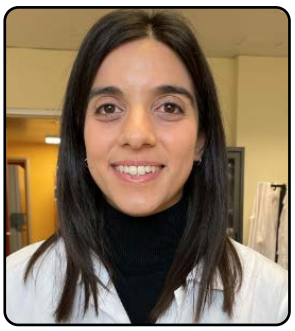

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Metabolomic characterization of autochthonous legume ecotypes

Autochthonous ecotypes or local varieties are plant genetic resources characterized by high genetic variability, specific adaptation to environmental stress conditions, and the presence of specialized metabolites (terpenoids, flavonoids, alkaloids) with human health-promoting effects. However, local varieties are gravely threatened by extinction mainly for their replacement by commercial varieties. One of the strategies to preserve these genetic resources and to draw the interest of local farmers and consumers involved in their conservation is to identify their unique characteristics. Untargeted metabolomics is a powerful approach that enables analysis of a wide range of metabolite classes and provides useful information for the discrimination of different local varieties, identifying their metabolic signatures and supporting their valorization and conservation. The present study aimed to provide a global view of the metabolite diversity of 3 autochthonous lentil ecotypes from different villages of Molise region (Italy)–Capracotta, CA; Rionero Sannitico, RS; and Agnone, A–in comparison to 1 ecotype from Umbria region (Italy)–Castelluccio di Norcia, CS–and 3 autochthonous bean ecotypes from Molise region (Italy)–Ciliegino bean, CI-, Basilicata region (Italy)–San Michele Rosso bean, SMR-, and Spain–Spanish Ciliegino bean, CI SP-. A quadrupole time of flight mass spectrometer-based liquid chromatography (LC-MS/MS) metabolomics technique allowed the detection of 407 and 544 differential accumulated metabolites (DAMs) for bean (Be) and lentil (Le) ecotypes, respectively. The annotation of the DAMs, by consulting home-made spectral and MS libraries (e.g., the GNPS Public Spectral Library) and a molecular network approach (MetGem and Cytoscape software), allowed 53% and 54% of them to be assigned to different metabolic categories (10 for Be and 13 for Le). Flavonoids were the most represented metabolic category (66 for Be, 87 for Le), followed by amino acids and derivatives (59 for Be, 61 for Le), and cinnamic acids (22 for Be, 50 for Le). However, the ten most important metabolic features for the discrimination of populations identified by the Variable Importance in the Projection (VIP) plot of PLS-DA belong to flavonoids, amino acids, and terpenoids for lentils and flavonoids for beans. Significant variations in the metabolite composition of Be and Le were also observed through the combination of univariate and multivariate statistical analyses. According to the PCA scores plot, A, CA, and RS lentil ecotypes were separated from CS by the PC1 (56% of variance). Similarly, CI and CI SP were separated from SMR by the PC1 (58% of variance). These results have been confirmed by the heatmap, allowing the selection of ecotypes-specific metabolic features. The enrichment analysis is in progress to assess the presence of enriched metabolomic categories for each ecotype, and thus improve the annotation process. To shed more light on the beneficial/health-promoting effect of some bioactive compounds, the antibacterial, antiproliferative, and antioxidative activity of both legume extracts were also evaluated and discussed according to the differential metabolic profiles characterizing each ecotype.

Audience Take Away Notes

- The audience will be introduced to the untargeted metabolomics approach for the characterization and discrimination of autochthonous ecotypes, exploring a wide range of metabolite classes. This knowledge applies to researchers and scientists involved in the valorization and conservation of

local varieties and, in general, in agro-biodiversity

- This research provides a basis for other faculty members to extend their studies on the untargeted metabolic analysis of plant species. A similar approach can be applied to similar studies on the characterization and valorization of plant genetic resources, or to studies involved in plant-environment interaction, enabling a deep and detailed understanding of the metabolic mechanisms and characteristics involved in the plant response to abiotic and biotic factors in the environment

Biography

Alessandra Renella is a Ph.D student in Biology and Applied Sciences at University of Molise conducting the research activity on the characterization and conservation of agro-biodiversity, particularly autochthonous legume ecotypes. In detail, supervised by Prof. Gabriella Stefania Scippa and Prof. Dalila Trupiano, she is studying the metabolomic profile of autochthonous legume ecotypes to explore their characteristics and support their valorization and, more in general, biodiversity conservation strategies. Ms. Renella previously obtained a master's degree from the University of Molise in 2021 where she worked on the physiological and biochemical responses of autochthonous bean ecotypes to abiotic stress.

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A study on financial feasibility and factors influencing production of dragon fruit in Karnataka province in India

The study main objective was to assess the financial feasibility for investment on dragon fruit cultivation using tools such as Benefit Cost (B:C) ratio, Net Present Value (NPV), Payback period and internal rate of returns in Karnataka province. The primary data were collected from 45 sample respondents in the Hydrabad-karnataka region of Karnataka Province during the year 2022. The results showed that, the B:C ratio was 1.8 and found to be profitable which could contribute to increase farmers income. Further, NPV indicated the present value of project over its life period of 10 years with discounted at the opportunity cost of capital. The findings revealed that, NPV was found to be Rs.54, 67, 235 per acre in study area. The highest positive NPV showed that, investment in dragon fruit cultivation was profitable venture. The second most important objective was to study the factors influencing the production of dragon fruit. This was analyzed using Cobb-Douglas production function. The results conveyed that, among the selected factors, only three factors such as irrigation charges, labor charges and expenditure on plant protection chemicals were found to be significant at 5 percent. At this backdrop, the study suggests that, the awareness program need to be conducted through extension education agencies and other line departments so that farmers with suitable climatic condition can grow dragon fruit to enhance farm the income.

Biography

Dr. Amrutha T Joshi has completed Doctoral program in Agricultural Economics during the year 2009 from University of Agricultural Sciences, Dharwad. She is specialized in subjects such as Agricultural Marketing, Agril. Finance & Project Management. She is having vast experience in the field of Teaching, Research and Extension activities for the last 22 years. She has joined as Assistant Professor in the year 1999, now serving as Professor and Head of Department of Agricultural Economics at University of Agricultural Sciences, Raichur. She has been associated and trained at national and international institutes such as IFPRI, Washington DC, USA and Indian Institute of Foreign Trade, New Delhi to name few. She is also involved in conducting different projects of economic significance, presently she is working as Principal Investigator for a research project on cost of cultivation of major crops in Karnataka funded by Karnataka Agriculture Price Commission, Bangalore. She as published many policy papers and more than 50 researcher papers on agricultural marketing, agricultural prices, land use, etc. and involved in preparation of bankable projects (feasibility reports) on agriculture for the benefit of farmers.

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What is the part of the microorganisms living in the rhizosphere of plants in reducing hazardousness in phytor emediation strategies for soils contaminated with toxic metals?

Soil is of most importance for living organisms and for the sustainability of all forms of life on earth. Nevertheless, all over the world there is a considerable area of polluted soils, mainly due to anthropogenic activities. Heavy metals are, amid pollutants, contaminants of great hazardousness, as they are not degradable and persist in nature, being not only toxic to living beings but being also dangerously bioaccumulable in the food chains. Using traditional methods of soil remediation to minimize this problem can present itself as a very expensive and not so effective solution to preserve soil functions. The establishment of a vegetable cover which can stabilize and ultimately remove the contaminants (phytoremediation) may represent a better option for such brownfields. However, such strategy encompasses the necessity of investigation of the toxicity of the existing contamination on plants and naturally on possible forms of decreasing it. A possible way of reducing metal toxicity to plants involved in such type of strategies may be the inoculation with efficient microbes–aiming at improving not only soil quality and therefore crop yield, but also at increasing the persistence of the applied plant crops. This presentation describes more comprehensively these microorganisms and the mechanisms through witch this microbiota can assist plant surviving heavy metal toxicity in such polluted soils, while simultaneously allowing their recovery.

Audience Take Away Notes

- This presentation will assist the audience to realise the advantages of using phytoremediation to stabilize an decontaminate metal polluted soils, and will increase the understanding of the role of plant associated microbiota on such remediation strategies, not only on soil health, but also on plant establishment and survival and on the pollutants availability and remediation

Biography

Ana Marques has completed her PhD in Biotechnology and her postdoctoral studies from the Portuguese Catholic University. She has been involved in research activities since 2000, when she was a researcher at Technical University of Denmark working on the production of bioparticles for biofilm applications. Since 2002 she has been developing work at CBQF/ESB-UCP concerning the remediation of disturbed soils using plant-based technologies, with the application of biological tools. She has published 2 book chapters and 25 papers in international peer reviewed journals, participated in numerous conferences and has been serving as a reviewer in several reputed scientific journals, having more than 1750 citations and a h-index of 21.

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The impact of agricultural crops and fertilizers used on the bacterial population of the soil and in particular on nitrifiing and denitrifying bacteria

Modern agriculture appears to have a very diversified impact on the soil not only for the crops used but also for the type of fertilizer used. One of the least studied impacts is that on the soil microbiome.

Maintaining a stable soil microbial community structure is crucial in preserving soil production potential and overall soil health. Various Nitrogen (N) addition strategies induced changes in soil physicochemical properties which are correlated with alterations in microbial community structure and partial microbial abundance, thereby displaying differences in carbon and nitrogen use efficiencies.

Therefore it becomes important to analyse how the microbiology of the soil and the effects of the fertilizers used can vary.

This study analyses the impact of the different kind of fertilizer on the Nitrogen concentration in the soil and the variations of microorganisms in the soil that can be linked to the nitrogen cycle based on the main cultures present in the region and on the different agronomic practices used. This case study allows us to identify as it is possible to analysed the nitrogen concentration in the soil and how nitrifying and denitrifying bacteria react. Through the use of real time PCR for the identification and quantification of nitrifying and denitrifying bacteria, it was done a study of the are very important in the ecological stability of the soil for a good practice in the agriculture system. The analysis of these bacterial types therefore allows us to outline a global picture of possible future treatments and the different forms of nitrogen that can be used for plant health and to avoid environmental impacts.

Audience Take Away Notes

- New kind of investigation of the nitrogen in the soil
- This study creates the basis for a new vision of fertilizer use in agriculture
- Allows monitoring of nitrogen compounds to avoid environmental contamination
- It is a practical solution to improve soil quality

Biography

Dr. Angelantonio Calabrese studied Biology applied to the enviromental at the CNR IRSA, Italia and graduated as MS in 2005. He create a research group at the Institute of Water Research Institute of the CNR He was created a new kind of research to analyzed the environmental status through the analyses of the bacteria population. She has published more than 50 research.

Anja Koroša*, Janko Urbanc, Marjana Zajc
Geological Survey of Slovenia, Ljubljana, Slovenia

Nitrate leaching from agricultural lands by means of mini lysimeter

Groundwater quantity and quality are of great importance for people's well-being and economic development. It is a very important resource for drinking water, irrigation and industrial uses. Different pollutants, including nutrients from agricultural areas, enter the groundwater due to various anthropogenic activities on the surface of the aquifer. According to the European Water Framework Directive (WFD), in every EU country all water bodies must be in good chemical and quantitative status.

The transport and dynamics of pollutants are among the most important processes in the aquifer, however many times they are not so well known. The transport of water and pollutants in aquifer depends, among others, on the characteristics of the unsaturated zone. The unsaturated zone of an aquifer serves as a water reservoir which discharges water and potential pollutants to the saturated zone for a relatively long time. Nitrate pollution in groundwater, originating mainly from agricultural activities, remains a worldwide issue. Understanding the mechanisms and rates of movement of nitrate in the unsaturated zone is an important issue in the process of groundwater protection.

Water and nitrate transport processes under different agricultural land uses have been studied with mini lysimeters to tests on water percolation and flux of dissolved nitrogen compounds on lysimeters, and groundwater age distribution. For the purpose of sampling the infiltrated water which flows into the agricultural land and through the unsaturated zone downward into the saturated aquifer zone, lysimeters were installed below the agricultural field. These captured the infiltrated water that actually feeds the aquifer and also transports pollutants from the surface to the groundwater. The knowledge of the chemical status of the infiltrated water helps us understand the impact of agricultural activity on groundwater quality under real weather conditions. Therefore, the water from lysimeter pans were periodically collected and analysed for pollutant content.

As expected, preliminary results show that the leaching of nitrates from agricultural land is much more significant in the case of agricultural use than in the case of grassland. On the test fields, we measured the average nitrate concentrations between 132 - 219 mg/l, while the average nitrate concentrations under the meadow were 16 and 23 mg/l. The results, therefore, show that from the point of view of water protection, meadow land use is much more favourable than arable land. The results will help reduce the impact of agricultural activity on groundwater and thus contribute to the preservation of groundwater quality.

This research is funded by the Slovenian Research and Innovation Agency ARIS (operation no. J1-4412 and P1-0020).

Keywords: Groundwater Pollution, Nitrate, Agricultural Activity, Lysimeter, Precision Agriculture.

Biography

Dr. Anja Koroša obtained her Ph.D. in 2019 and is a hydrogeologist on the Geological Survey of Slovenia experienced with hydro geochemistry, hydrogeology, emerging contaminants, water quality studies: design and implementation, visualization and data analysis, groundwater protection, study of unsaturated zone characteristics, use of natural and artificial isotopes in hydrogeology.

Dr. Anna Kirstgen*, Dr. Ewa Dönitz
Competence Center Foresight, Fraunhofer Institute for Systems and Innovation Research ISI, Karlsruhe, Germany

Exploring the future of Europe's sustainable urban agriculture initiatives trends and transformative narratives

Europe's rural and urban areas are facing growing problems due to climate change, loss of biodiversity, unsustainable use of resources and growing alienation between urban and rural dwellers. These trends threaten the sustainability of urban development and food systems.

At the same time, various forms of urban agriculture are developing in many European cities, such as community and rooftop gardens or vertical farming projects. Urban Agriculture (UA) can thus become an effective response to various urban challenges such as food security, preservation of green spaces and community development. The integration of urban agriculture into urban environments opens up opportunities to support sustainable urban development and make food systems more resilient. However, to leverage those potentials, it is necessary to understand the current and future developments and challenges related to UA in order to leverage the benefits of these initiatives for a more sustainable future.

In our study, we identify trends and challenges related to Urban Agriculture (UA) in urban environments. Social, technical, environmental, economic and political trends that influence future UA projects are analyzed and prioritized for their relevance as key drivers, challenges and opportunities for UA in city contexts.

In a participatory process, foresight analysis, scenario development and prototyping of new forms of urban agriculture will then help to identify future potential, further develop possible formats and make urban agriculture sustainable in different urban contexts as part of the European project Food City Boost. The project focuses on these developments by investigating the effects of urban agriculture and providing knowledge for practitioners and policy makers to promote and disseminate the sustainable development of urban agriculture. 100 stakeholders from six case studies are working together, using a living lab-based approach. This will allow learning from regions and cities across Europe where urban agriculture is already thriving and supported by regional policy.

Audience Take Away Notes

- Why is it important to understand current and future developments and challenges related to urban agriculture for a more sustainable future?
- How does the participatory process of foresight analysis, scenario development, and prototyping contribute to identifying future potential and making UA sustainable in different urban contexts?
- What are the social, technical, environmental, economic, and political trends that influence future UA projects and what are the challenges faced by Europe's rural and urban areas?
- How can urban agriculture be a response to urban challenges such as food security, green space preservation, and community development?

Biography

Dr. Anna Kirstgen is a futurologist and works at the Fraunhofer Institute for Systems and Innovation Research ISI in the business unit Foresight for Strategy Development. Her work includes identifying and analyzing signals, trends and possible futures in order to better understand the drivers of change in society, technology and markets. Anna structures complex issues and maps out possible future developments. With her work she helps clients to identify opportunities and designs robust strategies for the future. Her portfolio includes methodologies such as roadmapping, visioning, scenario processes, horizon scanning and trend radar. She works with a wide range of clients, including ministries, industries and the European Commission. Anna studied architecture at the Hafencity University in Hamburg and was a member of the International Doctoral Program "Spatial Research Lab –Urban Transformation Landscapes". In her doctoral thesis, she addressed the interplay of perception and effect of the built world by investigating the way in which space affects people and the means by which it is perceived.

U.Bagavathi Ammal[1]*, Gandhimathi . R[1], Sankar,R[1]., Coumaravel.K[1], Sanjay Srivastava[2]
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Post harvest prediction equation for groundnut crop in Mannadipet soil series of Puducherry

To apply soil test based fertilizer recommendations, the soils are to be tested after each crop. Hence it has become necessary to predict the soil test values after the harvest of the crop. It is done by developing post-harvest soil test value prediction equations making use of the initial soil test values, applied fertilizer doses, yields and uptake of nutrients obtained following the methodology outlined by Ramamoorthy et al. (1971).The post-harvest soil test values were taken as dependent variable and a function of the pre-sowing soil test values and the related parameters like yield, uptake and fertilizer doses.

The functional relationship is as follows

YPHS=f (F, ISTV, yield/uptake)
Where, YPHS is the post-harvest soil test value; F is the applied fertilizer nutrient and ISTV is the initial soil test value of N/P/K. The equation will take the mathematical form,

YPHS= a+b1F+ b2IS+b3 yield/uptake
Where, a is the absolute constant and b1, b2 and b3 are the respective regression co-efficients. Using these regression equations, the post-harvest soil test values of N, P and K were predicted after brinjal crop.

The results indicated that under NPK alone treatments, in the case of prediction of KMnO4-N, 84.5 and 84.9 per cent of the variations for KMnO4-N was accounted by the groundnut pod yield and nitrogen uptake respectively. With respect to Olsen-P, the variation was 96.0 per cent with groundnut pod yield and 92.4 per cent with phosphorus uptake. The variation of NH4OAc-K was 98.1 per cent with fruit yield and 99.0 per cent with potassium uptake were accounted by soil potassium and fertilizer potassium, yield and uptake respectively.

When the field was imposed with NPK + FYM @ 6.25 t ha-1, 86.8 and 85.0 per cent of the variations for KMnO4-N was accounted by the groundnut pod yield and nitrogen uptake respectively. The variation in post-harvest soil nitrogen was accounted by soil nitrogen, fertilizer nitrogen, fruit yield and uptake of nitrogen. With respect to Olsen-P, the variations were 96.3 and 97.8 per cent with groundnut pod yield and phosphorus uptake were accounted by soil phosphorus and fertilizer phosphorus. The variation of NH4OAc-K was 98.4 per cent with fruit yield and 87.6 per cent with potassium uptake were accounted by soil potassium and fertilizer potassium, yield and uptake respectively.

When the field was imposed with NPK + FYM @ 12.5 t ha-1, 99.8 per cent of the variations for KMnO4-N was accounted by the groundnut pod yield and nitrogen uptake respectively. With respect to Olsen-P, the variation was 89.6 and 97.4 per cent with groundnut pod yield and phosphorus uptake respectively. In the case of NH4OAc-K the variation was 98.8 and 98.0 per cent with groundnut pod yield and potassium uptake.

Significantly higher R2 `values recorded for the post-harvest soil test values prediction equations proved that these equations can be used with much confidence for predicting the soil test values after groundnut.

Key words: Post Harvest Soil test value, Groundnut yield, Uptake.

Atta K. Aidoo*, Jerry F. Asamoah, Kofi Frimpong-Anin, Ernestina N. Awarikabey, William L. Kota, Stephen Arthur, Moses B. Mochiah, Zippora Appiah-Kubi, Catherine K. Kaba, Maxwell Kwodane and Amina Dawood

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Profiling rice farms for the occurrence of major diseases at different growth stages in the Ashanti region of Ghana

Diseases of rice reduce grain yield and quality significantly in the major producing areas of Ghana. The limited availability of information on their incidence and severity led to the execution of this study to monitor and document major diseases affecting rice at different growth stages of the plant on farmers' rice fields in the Ashanti Region of Ghana. Rice disease surveillance was conducted in 2022 and 2023 in nine rice-growing communities. A total of 108 farms were assessed for disease incidence and severity using the Standard Evaluation System of Rice (SES). These surveys were done at four growth stages of rice, viz., nursery, vegetative, reproductive, and ripening stages. Ten rice diseases were observed on rice fields in the Ashanti Region. Out of the 10 diseases, five were observed at all growth stages of the rice plant and generally progressed with time. Brown spot and leaf blast were the most predominant diseases within the region, with mean incidences of 75.4% and 68.7%, respectively, at the ripening stage. Again, both similarly exhibited higher severity from the nursery to the ripening stage. There was no significant difference in disease occurrence among the communities for all the observed diseases, with the exception of false smut, whose incidence varied among the districts. Co-infection of pathogens was observed in several instances during the surveillance at all growth stages of rice. Brown spot and leaf blast continue to be the most important diseases of rice, as they were observed from the nursery to the ripening stage of the plant. This study is useful in designing integrated disease management for major rice diseases observed in the region.

Audience Take Away Notes

- This presentation emphasizes on the importance of rice diseases to ensuring a sustainable food security in most developing countries
- This study expresses the current disease dynamics within the Ashanti Region of Ghana and it is highly applicable to most rice-growing areas across the globe
- This study is of interest to researchers, academicians and students who are working on rice disease management
- Findings from this study will help in designing suitable integrated disease management strategies for rice farmers

Biography

Dr. Atta Kwesi Aidoo, is a Senior Research Scientist and Head of Section, Plant Pathology, CSIR-Crops Research Institute, Ghana. He has over 15 publications in the areas of plant pathology, seed health, pesticide use, etc., in reputed journals. He is a reviewer of six journals and a member of several national scientific societies, viz., the Research Staff Association (RSA), the Ghana Science Association (GSA), and the Plant Protection Society of Ghana (PPSG). He has handled several projects by different funding agencies such as KAFACI-YSRP, KOPIA-RPD, BAYER-FUNGICIDE, and BAYER-BACTERICIDE. He co-supervises eight postgraduates from three universities in Ghana.

Bahareh Sadat Haddadi[1*], Aiswarya Girija[2], Luis A. J. Mur[1]
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Metabolite and transcriptome profiling reveals drought adaptive strategies in the orphan African cereal, tef (*Eragrostis Tef*)

Background: Tef (*Eragrostis tef*), is a nutritious, gluten-free cereal rich in protein, fibre, vitamins, and minerals. It represents a good alternative cereal for individuals with gluten intolerance, such as those with celiac disease. Despite originating in Ethiopia, tef yields are limited due to drought stress. As an emerging crop, little is understood of its responses to challenging environments, therefore, characterising the key gene-metabolite changes under drought will be important in the derivation of new, elite climate-smart tef varieties.

Objectives: This study aimed to screen and characterize the response of diverse tef genotypes to drought stress.

Methods: For the current study four tef genotypes (Alba, Ent, Tsedey, and Manyi) were used. Three-week-old, tef seedlings were subjected to 15% (severe drought) water levels for 4 to 8 days, and their responses were compared to well-watered controls (65% water levels). The seedlings were harvested at the end of time points for metabolite and transcriptome profiling. The aerials parts of the seedlings were analysed for metabolite changes using Direct Infusion-High Resolution Mass Spectrometry (DI-HRMS) and expression profile of genes were done using Illumina based RNA-sequencing. Datasets and outputs from metabolomics and transcriptomics were analysed using R-based statistical packages.

Results: Metabolomic analyses revealed that drought caused a significant increase in the osmolytes (sugars) and stress metabolites (proline). More species-specific responses centred on major shifts in flavonoid metabolism, including kaempferol 3-O-rhamnoside-7-O-glucoside, afzelechin, and eriodyctiol; which may have an antioxidant role. Such changes could be linked to the results of transcriptomic profiling which indicated significant increases in genes of the phenylpropanoids biosynthesis pathway and substantial changes in sugar metabolism. Both omics assessments suggested increases in the Jasmonate (JA) phytohormone pathway which has been shown to be important to drought responses in other cereal species.

Conclusions: The observed shifts in JA and the flavonoid metabolism pathway could highlight an adaptive mechanism that could be important in tef's responses to drought stress. Boosting these pathways would be important in targeted breeding programs aiming to develop new varieties of drought-tolerant tef. This research contributes to our understanding of the molecular responses of tef to environmental stress, shedding light on the development of resilient crops to ensure food security in the face of changing climate conditions.

Keywords: Tef, Drought, Metabolomic, Transcriptomic, Gluten-Free.

Audience Take Away Notes

- To identify pathways associated with drought stress response in tef or other cereals
- These pathways could be targeted in breeding programs aiming to develop resilient cereals in water-scarce environments
- Showcase tef's nutritional richness as a superior gluten-free cereal
- Promote tef as a sustainable and nutritious choice, addressing dietary needs for gluten-intolerant individuals while enhancing overall nutritional intake

Biography

Bahareh Sadat Haddadi is a PhD student at Aberystwyth University. She is focused on enhancing comprehension of tef, a gluten-free cereal, particularly in the face of environmental challenges like drought. Ms. Haddadi previously obtained a master's degree from the University of Tehran in 2015 where she worked on the physiological and biochemical responses of Mentha aquatica to drought stress. Bahareh's research journey has been shaped by a passion for plant science and plant stress biology. Guided by Prof. Luis Mur, she is exploiting metabolomic and transcriptomic profiling of tef's responses to understand the responses of tef and other cereals to environmental stress.

Changsong Zou
School of Life Sciences, Henan University, China

Coupling of gland development and secondary metabolite synthesis in cotton

Cotton (Gossypium spp.) has evolved Pigment Glands (PGs) that accumulate toxic terpenoids, such as gossypol, which serve as a defence mechanism against pests. Laboratory experiments and field trials have confirmed that PGs are essential for tolerance to chewing pests in cotton. The intricate genetic mechanisms underlying the development of PGs and their role in the accumulation of secondary metabolites in cotton represent a significant focus for enhancing pest resistance in agricultural biotechnology. Our research identifies the gene GhVQ22, specific to PG tissues, as a pivotal regulator influencing both the size of these glands and the synthesis of secondary metabolites, notably gossypol. Through laser-capture microdissection transcriptome analysis and gene editing techniques, we demonstrate that the suppression of GhVQ22 results in enlarged PGs and modified secondary metabolite profiles, including a reduction in gossypol content and alterations in other key metabolites like kaempferol and catechin. The downregulation of GhVQ22 correlates with marked changes in the expression of PG development-related genes, offering new insights into the genetic interplay responsible for gland morphogenesis and metabolic pathways. Furthermore, our study reveals that GhVQ22 interacts with the core PG regulatory factors Gl2 and Gl3, suggesting a genetic network that finely balances the gland development with secondary metabolite synthesis. These findings not only contribute to our understanding of glandular trichomes in plants but also underscore the potential for genetic interventions in cotton to produce varieties with enhanced natural defence against pests.

Audience Take Away Notes

- The audience can learn about the complex genetic mechanism of PG tissue-specific gene GhVQ22 in the development of PGs and its role in the accumulation of secondary metabolites in cotton, and realize that GhVQ22 is a key regulator affecting the size of these glands and the synthesis of secondary metabolites (especially gossypol), which is of great significance in improving insect resistance in agricultural biotechnology
- The research not only contributes to the understanding of the mechanisms of plant gland development, but also shows the potential for genetic intervention in cotton to produce cotton varieties with enhanced natural defenses against pests
- This research could be used by other faculty to expand their own research or teaching
- The study could facilitate a more in-depth research on the tolerance of PGs to chewing pests in cotton.
- The study provides a way to inhibit GhVQ22 by gene editing technology to lead to PG expansion and alterations in secondary metabolite profiles, especially to reduce gossypol content
- The study will provide new pathways to finely balance glandular development and secondary metabolite synthesis by altering genetic networks

Biography

Prof. Changsong Zou received his M.S. degree from Yunnan University in 2007 and Ph.D. degree in Tropical Botany from Xishuangbanna, Chinese Academy of Sciences in 2010. From 2010 to 2016, he served as an assistant researcher and associate researcher at the Cotton Research Institute of the Chinese Academy of Agricultural Sciences, and from 2016 to 2018, he did postdoctoral research at the Shanghai Plant Stress Biology Research Center of the Chinese Academy of Sciences. He has been published 27 research papers in international mainstream journals such as Nature Biotechnology, Nature Genetics, Cell Research, Nature communications, PNAS, etc.

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Regulation of compound leaf development in *Medicago truncatula*

Leaf development requires highly regulated cell proliferation, differentiation and expansion patterns. As a model legume species, Medicago truncatula exhibits the simplest form of compound leaves; a single terminal leaflet is developed on the distal end of rachis and a pair of lateral leaflets is developed on both sides of petiole. M. truncatula belongs to the Inverted Repeat Lacking Clade (IRLC) of legumes. In the IRLC species, the orthologs of Leafy function in place of KNOXI to regulate compound leaf development, implying that the regulation mechanism of leaf development in M. truncatula is different from that of other model species, such as Arabidopsis thaliana, Cardamine hirsuta and Solanum lycopersicum. In addition, M. truncatula displays nyctinastic leaf movement which is generated by the pulvinus. Such leaf movements are common in the legume family (Leguminoseae) and the wood sorrel family (Oxalidaceae). By forward screening a large population of Tnt1 retrotransposon-tagged mutants of M. truncatula, we have identified several mutants that exhibited defects in leaf development and characterized the corresponding genes. More mutants with leaf developmental defects are being characterized to accelerate the understanding of the elaboration of compound leaves in M. truncatula.

Recently, we identified a novel pathway modulated by PINNA1 for the transition from trifoliate to pinnate-like pentafoliate leaves in M.truncatula. We found that mutations in PINNA1 led to the formation of ectopic leaflets in pinnately compound leaves, and the pentafoliate leaf in pinnna1 results from the activation of MtKNOXI. Genetic and biochemical analysis showed that PINNA1 has dual repression of KNOXI function in M. truncatula. PINNA1 represses the expression of MtKNOXI in leaf primordia, while PINNA1 interacts with MtKNOXI and sequesters it to the cytoplasm. Further investigations reveal that Unusual Floral Organs (MtUFO) is the direct target of MtKNOXI, and mediates the transition from trifoliate to pinnate-like pentafoliate leaves. This study provides insights in the compound leaf complexity controlling by the conserved and diverged molecular mechanisms.

Audience Take Away Notes

- Leguminous plants play essential roles in ecosystems, including nitrogen fixation and soil enrichment. Understanding leaf development in legumes contributes to our knowledge of plant diversity. By studying leaf development, we gain insights into legume adaptation and ecological interactions. Moreover, Educators can use examples from M. truncatula to illustrate fundamental concepts of leaf development in plant biology courses. By comparing and contrasting M. truncatula with other model species (e.g., Arabidopsis thaliana), students gain a deeper understanding of the diversity of leaf forms and the underlying genetic processes. The audience can use their understanding of leaf development in M. truncatula to enhance crop productivity, advance biotechnological applications, educate others, and contribute to environmental stewardship

Biography

Professor Chuanen Zhou obtained his doctoral degree from the School of Life Sciences at Shandong University in 2007. Following that, he conducted postdoctoral research in plant developmental biology and genetics at the Samuel Roberts Noble Foundation in the United States. In 2011, he was promoted to the position of Research Scientist. In 2013, Professor Zhou was appointed as a professor and doctoral supervisor at Shandong University. His research focuses on the molecular mechanisms underlying compound leaf development in plants. He has published over 50 research papers in academic journals such as Nature Communications, PNAS, The Plant Cell, Plant Physiology.

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Shoot and root omics signature in phytostabilization and hyperaccumulation model plants

The growing concern over soil contamination has led to increased interest in phytoremediation, a sustainable and cost-effective approach. Among other techniques, phytostabilization and hyperaccumulation have gained a lot of attention for their efficiency. Hyperaccumulation refers to plant potential by extracting metal (loid)s from contaminated soils while simultaneously reducing the toxicity of these tailings for future land development. Phytostabilization implies the reduction and immobilization of contaminants through plant roots. These contaminants are either adsorbed onto the root surface or precipitated within the rhizosphere, thereby hindering their migration into the soil. However, the success of these two approaches rely on the vegetation cover, which could be challenging in the highly contaminated soil. Recently, a variety of solutions, such as the use of different soil amendments/fertilizers, such as biochar and compost, have been explored for improving and accelerating the phytoremediation process (assisted-phytoremediation). However, gaps persist in our understanding of species-specific strategies for metal (loid) s exposure and the key proteins that could be targeted to enhance these desirable processes in the future. Arabidopsis thaliana, whose genome has been extensively studied, is a great model of phytostabilization. In contrast, Arabidopsis halleri is a facultative metallophyte and stoloniferous obligate outcrosser, belonging to the class of plants known as hyperaccumulators. Therefore, we employed a comprehensive approach that integrates proteomic and metabolomic analyses with in-silico techniques able to identify a significant number of differentially expressed proteins (DEPs) and metabolites (DEMs) in both root and shoot of Arabidopsis thaliana and Arabidopsis halleri under varying growing substrates (compost and/or biochar addition in metalloids contaminated soil). In detail, their contrasting responses were dissected by examining plant growth and metal (loid) accumulation capacity in both shoot and root, and related proteomic signatures.

Specifically, in the shoot samples, we identified 317 DEPs in A. thaliana and 373 DEPs in A. halleri. In root sample, total of 1538 DEPs were identified in A. thaliana, in contrast to 706 DEPs in A. halleri. The GO enriched analysis, complemented by a comprehensive pathway enrichment analysis, highlighted the distinct mechanisms that each species employs to regulate its response to metal (loid)s stress. Finally, 20 hub and bottleneck proteins were designated in each organ across A. thaliana and A. halleri to pinpoint the foundation for future research aimed at targeted genetic manipulation. Such advancements could revolutionize the field of environmental remediation, offering a sustainable solution to the global challenge of soil contamination.

Audience Take Away Notes

- The insights gained from this research are expected to significantly advance in understanding peculiar mechanisms adopted by metal (loid)s phytoastabilizing and hyperaccumulating plants
- More in general, this research represents a challenge for abiotic stress biology studies offering a good integrated analytical system able to decipher i) how plants respond to the different stressors

ii) which network are differentially activated and iii) which pathways are elicited

- This study holds the potential to pave the way for developing genetically engineered plants with optimized phytoremediation abilities
- Such advancements could revolutionize the field of environmental remediation, offering a sustainable solution to the global challenge of soil contamination
- This is therefore a “hot” topic for future discoveries that will reveal the evolution of diverse response mechanisms that could be valuable for the design of improvement strategies including for current environmental challenges

Biography

Dalila Trupiano is an Associate Professor in Botany at Department of Biosciences and Territory - University of Molise (Italy). Her research activities are carried out in the Plant Biology Laboratory, narrowing down its focus on plant environment interactions (from the cellular up to the organism level), by using morphological, anatomical, physiological, and molecular analyses. Furthermore, comparative proteomic analysis and phytohormones profiling, coupled by bioinformatics-modelling pipelines, are used in order to comprehend factors involved in plants response to different stresses. Innovative phenotyping image-based approaches are being developed to predict plant growth in different growth conditions (SCOPUS ID: 24559477600; ORCID ID: 0000-0001-8587-9971).

Dae-Yeon Suh[2], Damanpreet Kaur Sraan[1*]

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A sporopollenin definition for the genomics age

Sporopollenin (SP) is the main polymeric component of the outer walls of embryophyte spores and pollen. Resistance to acetolysis had been the sole criterion for the identification of SP. This imprecise definition resulted in claims for the existence of SP in algae and misguided research on the evolution of SP and its roles during terrestrialization. ASCL (anther-specific chalcone synthase-like) and four other enzymes in the polyketide pathway are involved in the biosynthesis of SP. In this study, I propose that all plants with ASCL also possess the other two genes in the polyketide pathway and that all three enzymes (ACOS, ASCL, and TKPR) are embryophyte-specific. This would suggest that the three enzymes co-selected in the embryophyte lineage. I discovered that similarly to ASCL, ACOS and TKPR are also specific to embryophytes and not found in algae. Hence, we propose to expand the definition of SP to include ACOS and TKPR as follows:

"Sporopollenin is a chemically resistant complex heteropolymer present in the outer walls of spores and pollen grains and is composed partly of hydroxylated polyketides derived from the conserved polyketide pathway, which involves *CYP703*, *CYP704*, *ACOS*, *ASCL*, *and TKPR*."

Biography

Ms. Damanpreet Kaur Sraan is currently a graduate student in Biochemistry at the University of Regina, Canada. She did her Engineering in Biotechnology from Sri Guru Granth Sahib World University, India. She has also earned the Entrepreneurship badge from UoR. She has also contributed to the findings of a paper entitled "*Takakia possesses a key marker of embryophyte sporopollenin*," published in *microPublication Biology*.

Derek Scuffell*, Mark Neal
Knowmatics, London, State, UK

Cost-effective IoT solutions for pest management: Tackling invasive species in smallholder agriculture

This presentation introduces a cost-effective IoT-based pest surveillance system, designed initially for smallholder farms in Tamil Nadu, India, to combat invasive species like the Fall Armyworm (FAW). Integrating affordable sensor technology, progressive web apps and knowledge graphs, this system delivers critical pest data to farmers, facilitating timely and effective responses. A key focus is on using the gathered wide-area surveillance data to develop comprehensive strategies against invasive species, contributing to sustainable agricultural practices. The approach, suitable for various agricultural and horticultural environments, demonstrates potential for global IoT application in improving crop yields and farming sustainability, especially for small-scale farmers.

Audience Take Away Notes

- Cost-effective IoT solutions for smallholder farmers
- Integrating technologies to create wide-area data for combating invasive species
- Adapting technology for diverse agricultural environments

Biography
Derek Scuffell is a seasoned professional with extensive experience in crop protection, computational biology, and agritech. Graduating from University of York, UK, Derek has been instrumental in developing innovative smart solutions in agri-food. With a passion for leveraging technology for sustainable agricultural practices, Derek has led numerous projects focusing on IoT applications in farming, notably the FAW project in Tamil Nadu.

Romário O. S. junior, Mariela Mattos da Silva, Sabrina Garcia Broetto, Thais Araujo dos Santos Gasparini, Gislane Chaves Oliveira, Rodrigo Theófilo Valadares, Oberdan José Pereira, Diolina Moura Silva*

Núcleo de Estudos da Fotossíntese. Department of Biological Sciences, Graduate Program in Plant Biology, Federal University of Espírito Santo, Center for Human and Natural Sciences, CEP 29075-910, Vitória, ES, Brazil

Ecological impact on the photochemical apparatus is alleviated by increased cyclic electron flow around photosystem I in restinga plants following Brazil's largest environmental disaster

The collapse of the Fundão dam, the biggest environmental disaster in the mineral sector worldwide, released millions of cubic meters of iron ore waste into the environment, causing chronic environmental impacts on several ecosystems. In this study, herbaceous plants from the coastal Restinga ecosystem (Canavalia rosea, Ipomoea imperati and Ipomoea pes caprae) were monitored in situ for three years (january 2021 to march 2023) to reveal the photoprotective functions of Cyclic Electron Flow (CEF) in these species. CEF in Photosystem I (PSI) can protect and maintain the stability of Electron Transport Chain (ETC) and Photosystem II (PSII), but its physiological mechanism under in situ conditions is poorly understood. Therefore, the main objective of this study was to identify a photochemical pattern capable of reflecting the contamination dynamics present in the ecosystem, using chlorophyll fluorescence emission as a tool to determine biophysical parameters related to plant vitality. The results indicate that during periods of greater precipitation there is a tendency for metals to bioaccumulate in the leaves, correlated with restrictions in the photosynthetic electron transport between PSII and PSI, observed by increased fluorescence intensity in OJIP curves, especially in the H band, which reflects the redox conditions of the Plastoquinone (PQ) pool. The increase in variable fluorescence at point I and the quinone turnover number also indicate higher redox activity of PQ. Thus, the alteration in electron transport flow revealed an adequate partition of electron flows on the acceptor side of PSI, alleviating the damage caused by Reactive Oxygen Species (ROS) through the Mehler reaction, diverting electrons from PSI directly to ROS (superoxide anion) prodution, forming less reactive ROS (hydrogen peroxide), which can then be are quickly neutralized by antioxidants in the chloroplasts. In conclusion, CEF alleviated the excitation pressure on the ETC in the leaves of Restinga plants, increasing heat dissipation in PSII, reducing oxidative stress, and maintaining PQ stability to accommodate the photosynthetic electron flow. Additionally, the impact assessment method used in this study can be applied to determine the contamination effects of tailings in other Restinga areas, based on OJIP transients and JIP test, significantly reducing the cost, labor, and time required for laboratory analysis.

Audience Take Away Notes

- **Environmental Consequences:** Understanding the impact of Brazil's largest environmental disaster on local ecosystems, specifically focusing on restinga plants
- **Photocellular Processes:** Explanation of the role of the photochemical apparatus in plants and how it is affected by environmental stressors
- **Cyclic Electron Flow:** Exploring the concept of cyclic electron flow around Photosystem I and its significance in plant physiology
- **Alleviation of Ecological Impact:** Discussing how restinga plants exhibit a mitigation of ecological damage through increased cyclic electron flow post-disaster
- **Implications for Conservation:** Examining the broader implications for environmental conservation efforts, particularly in response to large-scale environmental crises

Biography

Diolina Moura Silva completed her doctorate in Plant Physiology at the Federal University of Vicosa (UFV) in 1998. She is currently a Full Professor at the Federal University of Espírito Santo. She is also professor-advisor of the Graduate Program in Plant Biology and the Graduate Program in Biotechnology at the Federal University of Espírito Santo. She was the Coordinator of the Graduate Program in Plant Biology from its creation in 2003 until 2007. She works in the area of Plant Physiology and Biotechnology. She is the coordinator of the Photosynthesis Research Center, developing projects focused on the Photosynthesis of cultivated plants and particularly on the ecophysiology of fruit trees. In the context of her scientific and technological production, transient fluorescence of chlorophyll a, Photochemical efficiency, Photosynthesis.

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Fruit transcriptome profile comparison between prickly pear (*Opuntia albicarpa scheinvar*) and xoconostle (*O. joconostle FAC Weber*)

The nopal (Opuntia sp.) is a cactus with large diversity of species that is widely distributed in arid and semi-arid areas of Mexico. Out of the 200 Opuntia species, around 100 species are present in Mexico. Some species were cultivated for the consumption of tender cladodes (nopalitos) and principally for the consumption of fruits called prickly pears and xoconostles. The prickly pear is a sweet fruit with hundreds of seeds; its peel is thin, and its pulp is sweat and juicy, while the xoconostle is an acidic fruit with a thick peel and very little pulp. The objective of this study was to compare the variation of the genetic profile during developmental and ripening fruit stage to elucidate the key genes for sugar and organic acid metabolism in O. albicarpa and O. joconostle. Fruit samples of O. albicarpa and O. joconostle in three stages of development were collected in commercial orchards in San Martín de las Pirámides, State of Mexico. Total RNA from three biological replicates of fruits in three of developmental stage of each species was obtained using the PureLink™ RNA kit (Invitrogen, USA). 18 libraries were synthesized using the TruSeq Stranded mRNA kit and sequenced on an Illumina NovaSeq system. Trimmomatic was used to remove low quality reads, and the De novo transcriptome was assembled using Trinity. TransDecoder, BLASTp and BLASTx were used to annotate the transcriptome. Limma was used to extract genes differentially expressed in the three stages of fruit development for each species and to compare the two species. A total of 157,035 transcripts were assembled from which 98,575 transcripts had potential coding protein, revealing the presence of at least 12,507 genes in transcriptome assembly. Multidimensional plots showed that the first three dimensions accounted for 53% of the variability. The first dimension explained the most variation (30%) where a likely separation between the two species was revealed. While the separation between the phenological fruit stages was more apparent on the second and third dimensions. The pairwise comparisons between the different phenological fruit stage resulted in the estimation of 5,357 DETs (3,250 were upregulated and 2,109 were downregulated). Differentially expressed genes during O. albicarpa and O. joconostle fruit development related to carbohydrate metabolism were analyzed. Especially, genes related to starch, sucrose and organic acid biosynthesis. Several relevant genes for the sweetness of the prickly pear fruit had a different profile in the xoconostle fruit vis. Beta-Amylase 3 (BAM3), granule-bound starch synthase (WAXY), Sucrose Synthase (SS1) and Invertase 2 (INV2). On the other hand, genes related to the acidity of the fruit of O. joconostle had a different profile than that of prickly pear. vis. aconitase (ACO), Citrate Synthase (CS), Isocitrate Lyase (ICL), Malate Synthase (MS) and NADP-Isocitrate Dehydrogenase (NADP-IDH). The data presented here provide a publicly available transcriptome resource for O. albicarpa and O. joconostle. The results will promote advances in genetic and molecular studies and will facilitate the identification of candidate genes involved in the growth, development, and metabolism of this species.

Audience Take Away Notes

- The first assembly transcriptome resource of Mexican O. albicarpa and O. joconostle is presented
- Biosynthesis and metabolism of carbohydrates, especially starch, sucrose and organic were discussed
- Data obtained is publicly available, so audience can use these data for multiple genetic research
- The results obtained to broaden our knowledge about the genetics and biology of Opuntia
- The data could be used to evaluate and improve the harvesting and processing conditions of the Opuntia fruits

Biography

Ernestina Valadez-Moctezuma obtained a degree in Biology in 1981 and a Dr. Sci degree in 2001, both from the Universidad Nacional Autónoma de México. She received in 1987 a Master degree in Genetics from Colegio de Posgraduados, México. She is a Professor and Researcher at the Universidad Autónoma Chapingo since 1982 in Molecular Biology, Genetics, Molecular Markers, and Biotechnology areas. Actually, the main researcher lines consisted in differentiation and analysis of genetic variation in Opuntia spp. and Agave sp, principally; nevertheless, and microorganism associated to plants. She has published more than 85 papers in several scientific journals.

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Environmental and morphoagronomic variability of *Faba bean* cultivation in México

The broad bean (Vicia faba L.) in Mexico is cultivated in "Valles Altos". With the objective of determining the morpho-agronomic variation of local populations, 60 accessions were collected that were identified with the meteorological data of the collection site (31 localities)." Results are described such as: viability in fertility, size and shape of pollen grain; the protein, lysine and tannin content; stomatal density, leaf area and root volume.

The protein percentage varied from 17.9 to 33.0% and the lysine content was greater than 1.53%. Regarding stomatal variability (density, size, distance and area of the occlusive cells) there were significant differences in the number and distance between them.

The morphological variability found is acceptable. Broad beans with seed lengths between 20 and 30 mm predominate. Bean seeds with a high percentage of protein provide more lysine than those with low content, there was wide variability in the tannin content in the testa and there was variability in the root volume in strata.

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Stem cutting approach for producing *Combretum micranthum* G. Don, a medicinal melliferous plant in Tropical Savannah areas

Combretum micranthum is a wild medicinal melliferous tree from the tropical regions. As it is not domesticated and is intensively harvested, it is threatened to extinction and such extinction will hinder its ecological functions, the sociocultural and magico medicinal knowledge the community have developed around it. It urges then to develop suitable methods for its propagation and restoration in the entire tropical world. Beside the seed gemination which take too much time and yields genetically divergent seedling, stem cutting is an approach that helps maintain the genetic traits of the plant for the targeted pharmacological properties. At a nursery of the Republic of Benin, the most effective harvest season, the parts of the branch yielding the best vigorous seedlings and the optimal transplantation time were determined. The results showed that dry season cuttings yielded the best vigorous seedlings rate. Dry season Basal cuttings had the best survival rate while apical cuttings from the same season had the best vigorous seedlings rate at 43% versus 23% for the basal cuttings. Intermediate cuttings yielded low vigorous plantlets. The optimum nursery time was 90 days regardless of the harvest season. The technology did not require any root activator and the vigorous seedlings were available during the relevant reforestation season.

Keywords: Medicinal Plant, Melliferous Plant, Nursery, Stem Cuttings, Seedling, Tropical Area, Conservation.

Biography

Felicien Amakpe is a PhD holder from the Laboratory of Molecular Entomology and Bee Pathology of Gent University (Belgium). Conservation officer at the General Directorate of Forest and Natural Resources of Benin, he is a researcher at the Centre Beninois de la Recherche Scientifique et de l'Innovation (CBRSI) and lecturer at the university of Abomey-Calavi in biosecurity and pollinator conservation. He is the operational National Focal Point of the Convention on Biodiversity (CBD) in charge of the Cartagena Protocol of Benin. Active member of the West African biosafety expert group and member of the steering comity of the West African Program on Vectorial Diseases Management, he was also a member of the Ad Hoc Technical Expert Group on Synthetic Biology of the CBD. His main fields of expertise and competence include beekeeping and pollinator conservation, land use land cover; biodiversity conservation, forestry, LMO and pesticide risk assessment, poverty alleviation, rural development, Biosecurity.

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A transcriptome meta-analysis to depict functionalities and biomarkers of the root under pathogen infection

Pathogens affect plant health and stability. However, there is a lack of methodologies to understand the infection progression and its possible outcome, especially in urban environments where plants are needed to provide beneficial ecosystem services and can threaten the environmental safety. Thus, the aim of this work is to identify genes to be used as possible biomarker to monitor the root response to pathogen infections and assess the root health for diagnostic/prognostic purposes.

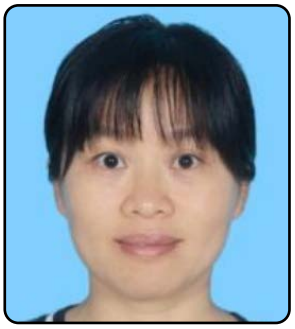
Accordingly, we seeked literature to identify RNA-seq transcriptomic datasets from plants under pathogen attack to be used in a co-expression meta-analysis. Genes were grouped according to their expression patterns into modules which were undergone to a functional enrichment together with the identified differentially expressed genes. This led the characterization of species-specific and common functional features active under pathogen infection in the root. Furthermore, the co-expression networks were queried to sign the biomarkers which offer a molecular target to monitor the presence and the progression of the pathogen infection. These results may offer novel and advanced tools allowing the identification of the pathogen presence and its possible monitoring in the plants through molecular approaches. These can be based on non-invasive and non-disruptive sampling and are of relevance especially for being applied in urban contexts.

Audience Take Away Notes

- The mechanisms underpinning root pathogen infection will be revealed allowing a deeper understanding of their complexity
- The approach based on a meta-analysis give the possibility to integrate knowledge based on multiple species forecasting insight on species-specific peculiarities, common pathways and main markers pivotally involved in the response of the roots to pathogens' infection
- The potential of this approach is high since co-expression meta-analysis offer a wide range of applications, included genetically targeting of identified biomarkers, development of diagnostic/prognostic methods. Additionally, such types of approaches are supported by the increasing amount of transcriptomic data and can be extended including in the analysis knowledge from other species or organs
- Identified function/biomarkers will provide targets to be used in non-disruptive molecular approaches for diagnostic or prognostic purposes allowing the identification of possible signature of the pathogen presence, particularly desirable for monitoring plants especially in urban environments

Biography

Gabriella Sferra is a Researcher in Botany at University of Molise with a wide experience in bioinformatics applied to plant research. Currently, her researches, under the National Biodiversity Future Center program (Funded under the National Recovery and Resilience Plan (NRRP), Mission 4 Component 2 Investment 1.4-Call for tender No. 3138 of 16/12/2021, rectified by Decree n.3175 of 18/12/2021 of Italian Ministry of University and Research funded by the European Union–Next Generation EU; Project code CN_00000033, Concession Decree No. 1034 of 17/06/2022 adopted by the Italian Ministry of University and Research, CUP:H73C22000300001), focus on the characterization of the root system in urban environments specifically considering the links with abiotic/biotic stressors. (SCOPUS ID: 55928742800; ORCID: 0000-0001-6721-8547)



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A comparative study of sweet corn industry development: Unveiling perspectives from China and the United States

This study compares the sweet corn industries in the United States and China, the top global producers. The United States has experienced a 47.2% decrease in planted area and a 27.9% decrease in yield since the 21st century. Over 70% of the United States planting is dedicated to processing sweet corn, which has been on the rise. Fresh sweet corn prices have increased by 119.2%. Sweet corn exports of the United States have declined by 18.5% in volume and 4.3% in value since 2015, while imports have risen by 63.5% in volume and 115.7% in value, nearly tripling the 2005 amount. In contrast, China has seen a threefold increase in planting area and a tenfold increase in yield, making it the world's leading producer. Planting areas have expanded nationwide, with fresh consumption dominating the market and processing sweet corn accounting for less than 30%. In 2022, China's sweet corn exports were 8.8 times higher in volume and 24.4 times higher in value compared to 2005, while imports decreased by 34.1% in volume and 29.4% in value. Recommendations for the United States involve improving irrigation, transportation, and logistics infrastructure, adjusting industrial structure and layout, and innovating processing products. China should invest in the seed industry, adopt suitable machinery for hilly areas, focus on product innovation, enhance the financial and insurance market, improve processing technology, and strengthen government monitoring and statistics.

Audience Take Away Notes

- This study will provide the audience with a detailed development of the sweet corn industry in the United States and China over the past 20 years
- It can help some scientists engaged in sweet corn research understand the detailed situation of the sweet corn industry in China and the United States
- It can assist some entrepreneurs engaged in sweet corn to scientifically formulate their planting plans, improve their product structure and business plans
- It can help agricultural government formulate more reasonable support policies and guide the healthy and sustainable development of sweet corn industries

Biography
Dr. Gan studied at Institute of Botany, Chinese Academy of Sciences from 2005 and graduated as MS in 2008. She then started to work in the Institute of Agricultural Economics and Information, Guangdong Academy of Agricultural Sciences till now. In 2017, She received her PhD degree from the South China Botanical Garden, Chinese Academy of Sciences. In 2018, she obtained the position of an Associate Researcher at Guangdong Academy of Sciences. She has published more than 50 research articles in SCI(E) journals.

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Unveiling the physiological role of betanin breakdown products on stress response mechanisms in germinating arabidopsis

Seed germination is a pivotal stage in plant development, subject to numerous internal and external factors. While mitochondrial activity, ROS balance, and phytohormonal regulation are well-known, recent studies suggest additional involvement of bioactive compounds, such as those found in agricultural byproducts. This study investigates the potential effects of Betanin Degradation Products (BDPs), derived from discarded pitaya fruit processing waste, on Arabidopsis thaliana germination and early seedling growth, grown under standard, under salt (100 mM NaCl) or osmotic (100 mM Mannitol) stress condition.

The research encompasses various physiological processes, including ROS signaling, proline accumulation, and phytohormonal regulation. Interestingly, lower concentrations of BDPs (0.02–0.20 mg L-1) enhanced seedlings development performances and biomass compared to controls, while higher doses (>1.00 mg L-1) show adverse effects on morphological traits. Moreover, the beneficial concentrations displayed positive effects also on seedlings grown under abiotic stress conditions.

Through assessments using the MTT assay on both seeds and purified organelle fractions, it is confirmed that the distinct compounds within BDPs neither affect mitochondrial activity nor compromise its integrity. Mechanistically, BDPs modulate ROS signaling by reducing free H2O2 content through enhancing antioxidant activity and regulating the expression of ROS scavenging genes. Furthermore, BDPs influenced proline accumulation, indicating enhanced stress tolerance. The observed rise in proline content correlates with alterations in its metabolism and catabolism, evidenced by changes in gene expression associated with these pathways.

Additionally, BDPs disrupt phytohormone homeostasis, favoring seedling establishment. Particularly, the balance between ABA/ABA-glu, tZea/tZea-rib, and tZea/IAA suggests improved germination performance and seedling development at lower concentration ranges (0.02–0.20 mg L-1) and inhibition at higher doses. The increase in GA4 and GA7 content compared to other gibberellins implies involvement of GA13ox, a crucial enzyme in the biosynthetic switch, supported by gene expression evaluations.

In conclusion, the findings of this study underscore the promising role of betanin degradation products as sustainable enhancers of plant growth, particularly in mitigating the impacts of abiotic stress on germination and early seedling development, opening avenues for their application in agriculture.

Audience Take Away Notes

- **Application in Practice:** Agricultural practitioners can apply the insights from this research to improve their approaches to managing crop growth and development, particularly under stress conditions like salt and osmotic stress. By understanding how betanin degradation products influence plant responses, they can make informed decisions about using biostimulants derived from agri-food waste to enhance crop resilience and productivity
- **Job Enhancement:** This research equips professionals in the agricultural sector with valuable knowledge that directly impacts their job performance. Understanding the mechanisms underlying plant stress responses enables them to develop more effective strategies for crop management, leading to better outcomes in terms of yield and quality. Furthermore, this research has the potential to inspire the biostimulant industry to develop novel prototypes utilizing agri-food waste enriched with these bioactive compounds
- **Expansion of Research and Teaching:** The findings of this study can serve as a valuable resource for other faculty members involved in plant physiology, stress biology, or agricultural science. They can use this research to expand their own investigations or incorporate relevant concepts into their teaching curriculum, enriching both research endeavors and educational programs. Until now, no biostimulant formulation containing BDPs are commercially available
- **Practical Solutions for Designers:** For designers and developers in the agricultural industry, this research provides practical solutions for addressing challenges related to plant stress. By elucidating the effects of betanin degradation products on physiological processes, it offers insights that can simplify the development of interventions aimed at improving plant resilience, making designers' jobs more efficient and effective. The current lack on biostimulant research line is the lack in understanding the potential mechanism of action
- **Enhanced Design Accuracy:** The research contributes to improving the accuracy of design strategies by providing a deeper understanding of the molecular mechanisms involved in plant stress responses. Armed with this knowledge, designers can develop more precise interventions tailored to specific stress conditions, ultimately leading to better outcomes in terms of crop performance and sustainability

Biography

Giuseppe Mannino, a Junior Assistant Professor in the Plant Physiology Unit at the University of Turin, is dedicated to studying plant-derived bioactive compounds. His expertise lies in conducting comprehensive metabolomic and transcriptomic analyses to characterize these compounds. Mannino's research delves into natural biostimulants that can trigger substantial phenotypic and physiological shifts in plants. Employing advanced methodologies such as gas and liquid chromatography coupled with mass spectrometry, he conducts thorough metabolomic assessments. Furthermore, Mannino evaluates gene expression using cutting-edge techniques like RNA sequencing (RNAseq) analysis or quantitative real-time polymerase chain reaction (qRT-PCR).

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Is productivity a major constraint in India's competitiveness in the global agricultural commodity market?

Productivity primarily determines the competitiveness of a country. Countries with high productivity can become highly competitive in the global market and enhance their export revenues. On the other hand, productivity shocks can worsen the commodity price dynamics in the domestic market and affect the competitiveness of the country. Role of productivity has not been extensively analysed in agriculture trade worldwide and especially in India. Hence, an attempt is made to understand the role of productivity in agricultural exports of India through Vector Error Correction Model (VECM). Competitiveness of the nine major agricultural commodities exported from India has been analysed to understand the role of productivity in influencing exports. As a first step, the trends in productivity of the nine commodities in India and leading producing and exporting countries globally is ascertained and compared. Then the impact of productivity on exports is analysed using regression models. The results shows that there is a long run relationship between productivity and exports and a percent increase in the productivities of Rice, Wheat, Sorghum, Groundnut, Sugarcane, Millets, Tea, Coffee, and Bengal gram will increases their exports by 2.95 percent, 10.98 percent, 24.21 percent, 1.11 percent, 5.14 percent, 1.88 percent, 1.85 percent, 5.23 percent, 18.51 percent, 7.84 percent, respectively, in India. The productivity trend analysis and CAGRs have shown that India has performed relatively well in different time periods (1961–2020, 1961–1990, 1991–2020 & 2006–2020) compared with other major producers and exporters of selected agricultural commodities. Overall analysis of the data and the literatures have shown that sustainable cultivation practices and supportive government policies towards viable productivity enhancement measures can improve competitiveness of India in the global commodity market.

Biography

Dr. Gopal Naik, served as a Professor in the Economics Area at IIM Bangalore for 20 years. He obtained his Ph.D. from the University of Illinois, Urbana-Champaign, IL, USA. His focus areas have been agriculture and rural development. Many of his works facilitated policymaking at the government level. He has been coordinating the Unnat Bharath Abhiyan initiative by Govt. of India, which is inspired by the vision of transformational change in rural development processes by leveraging knowledge institutions. Led by Prof. Naik, IIMB's Centre for Public Policy (CPP) has developed a tele- education project (Satellite & Advanced Multimedia Interactive Education (SAMIE) which was reaching nearly 200,000 schoolchildren in 1000 schools in rural backward regions in Karnataka. This project won the prestigious World Summit on Information Society (WSIS) 2015 Award of the International Telecommunication Union (ITU) and the United Nations in Geneva for innovative applications. In 2022, Prof. Naik was appointed the Jal Jeevan Mission Chair in Utility Development & Water Economics.

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Enhancing plant resilience through abiotic stress priming: insights from *Miscanthus x Giganteus*

Abiotic stress poses a significant challenge to the productivity and sustainability of perennial crops like Miscanthus x Giganteus (MxG). Our study investigates the effects of abiotic stress priming, focusing on nitrogen and copper treatments, as well as physical priming (hot and cold treatments), to enhance plant resilience and biomass production.

Nitrogen application, particularly through foliar spraying, demonstrated substantial benefits, including prolonged vegetative periods and increased biomass production. This treatment also enhanced photosynthetic efficiency, as indicated by elevated chlorophyll fluorescence indices and improved photochemical performance (Fv/Fm and Pi abs). Interestingly, nitrogen treatments led to increased lignin and cellulose synthesis, suggesting an augmentation of structural integrity in response to stress.

Conversely, copper treatments exhibited a complex interaction with plant physiology. While lower concentrations of copper applied to leaves enhanced carotenoid levels and photosynthetic activity, higher concentrations were detrimental, reducing biomass and altering stomatal density. The response to copper stress varied significantly between rhizome soaking and foliar application, highlighting the importance of application method.

Physical priming with cold treatment (10°C) significantly increased lignin production, enhancing structural integrity under stress conditions. In contrast, hot priming demonstrated limited beneficial effects, with plants showing decreased biomass and vitality. These findings suggest that the type and method of priming significantly influence the physiological and morphological outcomes in MxG.

Overall, our findings underscore the potential of abiotic stress priming to enhance the resilience of MxG, offering promising strategies for improving the productivity of bioenergy crops under suboptimal conditions. These insights contribute to a deeper understanding of plant stress responses and inform the development of sustainable agricultural practices.

Audience Take Away Notes

- The audience will gain knowledge on improving crop resilience and productivity through targeted stress priming techniques

- Practical applications of the research can be implemented in agricultural practices to enhance crop yield and sustainability
- The findings provide a foundation for further research into abiotic stress priming and can be incorporated into teaching materials related to plant science and agricultural sustainability
- The research offers practical solutions for enhancing crop resilience and productivity, which can simplify the management of bioenergy crops

Biography

Dr. Hana Auer Malinská completed her Ph.D. in General and Molecular Genetics at Masaryk University Brno, Czech Republic in 2012. Since 2015, she has been a faculty member at the Department of Biology, Jan Evangelista Purkyně University in Ústí nad Labem, where she teaches courses in Plant Physiology, Molecular Biology, Didactics of Biology, and Plant Biotechnology. Dr. Auer Malinská has extensive research experience, having worked in the Laboratory of Molecular Epigenetics at the Institute of Biophysics, Czech Academy of Sciences. She is the author of 20 publications in high-impact journals and has an H-index of 11.

Hellen Chelagat Maina
Forbrs Mentorship Kenya, Kenya

Sustainable agriculture: Innovations for a greener future

Sustainable farming focuses environmentally friendly, socially responsible, and economically viable farming practices. Innovations such as precision farming, organic methods, agroforestry, and water-efficient techniques are key to achieving a greener future. These approaches promote efficiency, productivity, and resilience while minimizing negative environmental impacts, helping to address challenges like food security, climate change, and environmental degradation.

Audience Take Away Notes

- **Importance of Sustainable Agriculture:** They will understand why sustainable agriculture is crucial for ensuring food security, conserving natural resources, reducing environmental impact, and addressing climate change challenges
- Principles of Sustainable Agriculture such as soil health management, water conservation, biodiversity prevention, and integrated pest management
- **Innovations in Sustainable Agriculture:** They will be introduced to innovative practices and technologies that promote sustainability in agriculture such as precision farming, vertical farming, agroforestry, organic farming and use of renewable energy resources
- **Role of Technology:** they will understand how technology, including IoT, Artificial Intelligence (AI), drones and data analytics, is being used to enhance productivity, optimize resource use, and minimize environmental impact in agriculture
- **Case Studies and Success Stories:** They may also learn about real-world examples of successful sustainable agriculture initiatives from the around the world, highlighting the benefits and outcomes of implementing sustainable practices
- Explain how the audience will be able to use what they learn? They can apply the knowledge in various ways;
- **Implement Sustainable Agriculture:** Individuals involved in agriculture can apply sustainable farming practices in their own farms or their communities, practices such as crop rotation, organic farming, and water conservation technologies
- **Advocate Change:** The audience can advocate for policies that support sustainable agriculture at local, national, and international levels. They can engage with policymakers, community leaders, and agricultural org to promote sustainable practices and influence decision-making processes
- **Educate others:** They can share their knowledge with others, including farmers, consumers, students, and community members. They can inspire others to adopt greener practices
- **Engage in Research and Development:** Researchers and innovators in the audience can contribute to the development of new technologies and practices that promote sustainability in agriculture
- Sustainable agriculture can help the audience in their jobs by providing opportunities for innovation, efficiency, environmental stewardship, risk mitigation, research, policy development, education, and collaboration. By incorporating sustainable agriculture principles into their work, they can contribute to a more sustainable and resilient agriculture sector
- Research on sustainable agriculture for greener future provides a rich and diverse field of study that faculty members can use to expand their research and teaching activities. They can also contribute

to advancing knowledge, promoting sustainability in agriculture, training the next generation of professionals, and making a positive impact on society and the environment

- It can provide practical solutions that simplify or make designer's jobs more efficient, especially in the context of designing agricultural systems, technologies, and products
- **Designing Sustainable Agricultural Systems;**
    a. **Integration of Sustainable Practices:** Designers can incorporate sustainable agriculture principles into the planning and development of agricultural systems such are soil health, water efficiency, and resource optimization, designers can create more resilient and environment friendly agricultural operations.
    b. **Agroecological Design:** They can apply agroecological principles to the design of farms, landscapes, and food production systems. This approach emphasizes the interactions between crops, soil, livestock, water, and biodiversity to create productivity.
- **Developing Sustainable Agricultural Technologies**
    a. **Innovative Solutions:** Designers can develop innovative technologies and tools that support sustainable agriculture which includes irrigation systems, renewable solutions, agroforestry layout and equipment for organic farming.
    b. **User-Centered Design:** by considering the needs and preferences of farmers and agricultural workers, designers can create user-friendly and efficient technologies that promote adoption of sustainable practices on the ground.
- **Creating Sustainable Agricultural Products**
    a. **Packaging and Materials:** designers can design sustainable packaging materials for agricultural products such as biodegradable containers, eco-friendly labels, and compostable packaging solutions. This can help in reducing waste and environmental impact in agricultural supply chain.
    b. **Product Design:** Designers can work on developing sustainable agricultural products such as farm tools, equipment inputs (fertilizers, pesticides), and machinery that are energy-efficient, environmentally friendly, and promote sustainable farming practices.
- **Visual Communication and Education**
    a. **Graphic design**: Visually materials, such as infographics, posters, educational materials, and digital content to communicate information about sustainable practices to farmers, stakeholders and general public.
    b. **Interactive design:** develop interactive tools, apps, and platforms that facilitate knowledge sharing, decision-making and training related to sustainable agriculture.
- It will improve the accuracy of a design, or provide new information to assist in a design problem
- Sustainable agriculture can contribute to design accuracy and problem-solving in the following ways;
- Data-Driven Design:
    a. **Precision Agriculture:** Sustainable agriculture practices like precision agriculture leverage data, sensors, and technology to optimize inputs, monitor crop health, and improve resource efficiency. Designers can make more accurate decisions based on real-time data and insights.
    b. **Data Analytics:** Sustainable agriculture generates a wealth of data related to soil health, weather patterns, crop performance, and resource use. They can use this data to inform design decisions, identify trends, and optimize solutions.
- **Environmental Consideration**
    a. **Eco-Design Principle:** Designers can apply eco-design principles to ensure that their designs are environmentally friendly, energy-efficient, and harmony with nature.
    b. **Life Cycle Assessment:** SA promote the use of life cycle assessment tools to evaluate the

environmental impacts of agriculture. Designers can use this information to design products and systems with lower environmental footprint.

- **Innovative Solutions:**
    a. **Agroecological Design:** Designers can draw inspiration from agroecological principles to create innovative and resilient designs that work in harmony with nature.
    b. **Biomimicry:** By mimicking natural processes and structures, designers can develop more efficient and sustainable designs.
- List all other benefits.
    - Environmental Benefits:
    - Conservation of natural resources
    - Reduction of pollution
    - Climate change mitigation
    - Economic Benefits
    - Improved farm productivity
    - Market opportunities
    - Resilience to market fluctuations
    - Social benefits
    - Enhanced food security
    - Support for rural communities
    - Promotion of social Equity
    - Health benefits
    - Nutritious food
    - Reduced exposure to pesticides
    - Promotion of well-being
    - Resilience and adaptation
    - Climate resilience
    - Adaptation to changing conditions

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Safety first as a competitive advantage for agri-business

The aim of this contribution is to present a research project that focus on how agricultural entrepreneurs work to reach safe and sustainable working processes in their businesses, and by this contribute to concept development regarding how safe and sustainable processes can be developed and create sustainable competitiveness in the industry.

It is important to study work processes regarding safety and sustainability in Swedish agriculture for several reasons. Several actors in society point out the importance of having a sustainable and safe work environment. The Swedish government has formulated an updated work environment strategy for the future for the period 2021–2025. The Government states that the occupational injuries entail severe financial consequences at the individual and societal level as well as personal suffering for those affected. The work environment strategy for 2021–2025 focuses on the sub-goals (i) a sustainable working life - everyone must be able, strong, and willing to work a full working life, (ii) a healthy working life - working life must contribute to development and well-being, (iii) a secure working life - none should risk life or health due to the job and (iv) a labor market without crime and cheating. However, the Swedish Work Environment Authority believes that fatal incidents should be greatly reduced by companies developing a good safety culture and functioning systematic work related to the security aspects in the industry. The agricultural industry is one of the industries that has had the most accidents in the last decade, also with fatal outcomes. It shows the centrality of studying work processes regarding safety and sustainability in the agricultural industry. The Swedish Work Environment Authority believes that fatal incidents should be greatly reduced by companies pursuing a good safety culture and functioning systematic work environment work. It is therefore important to conduct research and development work regarding safe and sustainable work processes in the agricultural industry.

The project is conducted in co-operation with agricultural extension services and agricultural entrepreneurs who actively are working with the development of their businesses. We will use both qualitative and quantitative methods to answer these questions and fulfill the aim of the project. That is, the data collection will include both interviews, observations, and questionnaires. There will be both academic and practical contributions from the project.

Expected results from an academic perspective will be the identified safe and sustainable working processes and how these can serve as a competitive advantage in Swedish agriculture. Expected results for practice will be new knowledge about safe and sustainable working processes as well as suggestions of problem solutions for agricultural entrepreneurs.

Audience Take Away Notes

- Coaching towards safety first will be discussed, by analyzing the scope of safety work together with

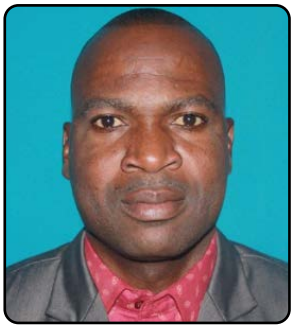
behaviors of a proactive and reactive nature

- The practical problem relates to the problematic situation with accidents in the agricultural industry (including smallholder forestry) together with increasing market competition
- The empirical and theoretical problem can be defined through the fact that we lack research about how agricultural entrepreneurs work to integrate safe and sustainable working processes in their businesses. We also lack conceptual models for how to reach safe and sustainable working processes in the industry

Biography

Henrik Barth is an Associate Professor in innovation sciences, and is currently working with several research projects addressing sustainable business model innovation and specifically the transformation phase from conventional to digital solutions.

Pia Ulvenblad is an Associate Professor in Business Administration focusing on Organisation and Leadership. She has done research on how new businesses work with their communication strategies and business development, and she has for many years been working with the Swedish food industry.



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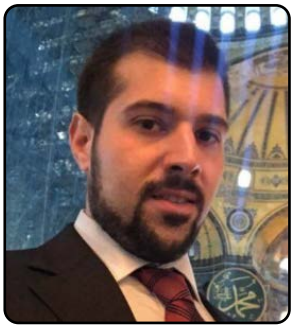
The impact of urban market gardening on household livelihoods and food consumption

Today, the world is faced with the problem of meeting the food needs of its population. This problem is increasingly observed in certain cities already facing a high poverty rate. In Burkina Faso, agriculture is the main source of income for the poorest populations and the pillar of the country's food security. The fruit and vegetable sector occupies a special place among the promising sectors selected in Burkina Faso. Indeed, it contributes significantly to the fight against food insecurity and the reduction of poverty. However, the production and consumption of healthy vegetables and fruits remains a major concern in our different cities. The objective of this study is to assess the impact of urban market gardening on household livelihoods and food consumption. The study was conducted in the two major cities of Burkina Faso, namely Ouagadougou and Bobo-Dioulasso. To obtain two separate samples, they were randomly constituted using an individual survey questionnaire for each: a sample of 300 market gardeners, including 150 per city, spread across three sites. And a sample of 200 urban households including 100 per city. At the level of market gardeners, the aim was to determine the share of market gardening income in the formation of the total annual income of the market gardener. At the household level, we assessed preferences for fresh or processed products, and their frequency of consumption per day.

Audience Take Away Notes

- The public will know whether market gardening contributes to the fight against food and nutritional insecurity through the formation of income and consumption in peri-urban and urban areas
- The public will know the level and preference of consumption of fruits and vegetables in peri-urban and urban areas
- Researchers at other institutions could use the information from this study for their teaching or use the methodology to improve their research
- It is a practical solution to improving food security

Biography
Inoussa Compaore studied at the Polytechnic University of Bobo-Dioulasso, now Nazi BONI University, and he obtained a degree in rural development engineering with an option: Water and Forests in 2008. He continued his Master's studies of research in genetics and plant biotechnology at the University of Ouagadougou in 2010. The same year, he continued his doctoral studies at Nazi BONI University where he defended his unique doctoral thesis in rural development in 2018 (specialty: fish production). Seconded to this university, He continued his career as a teacher-researcher. Today he is a lecturer in fisheries sciences with a total of around twenty research articles. His research work generally focuses on the development of the rural world.



Ioannis Ladas
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The role of ethics in molecular biology research on endangered plant species

Molecular biology research on endangered plant species holds critical ethical considerations that intertwine conservation efforts with scientific advancement. As biodiversity across the globe faces unprecedented threats from human activities and climate change, the application of molecular techniques to conserve endangered plant species becomes not only a scientific priority but also an ethical imperative.

The ethical challenges in this research field revolve around several key issues. Firstly, the potential for genetic modification and cloning techniques to alter naturally occurring genetic makeups raises questions about the 'naturalness' of conserved species and the long-term ecological impacts of such interventions. Secondly, access to and sharing of genetic resources, often located in biodiversity-rich but economically poor regions, can lead to disputes over intellectual property rights and benefit-sharing, necessitating a fair and equitable framework.

Our presentation will explore these ethical dimensions by examining case studies where molecular biology has been applied to conserve endangered plant species. We will discuss the responsibilities of scientists in balancing technological possibilities with ecological sensitivity and respect for local communities' rights and knowledge. Furthermore, we will propose guidelines for conducting ethically responsible research that respects both the scientific goals and the ecological and cultural contexts of the species under study.

Through this analysis, we aim to provide a comprehensive overview of how ethical considerations are integral to guiding research practices in molecular biology, especially in projects involving endangered species. The goal is to foster a dialogue on how to advance scientific research while ensuring that it contributes positively to conservation efforts and respects all stakeholders involved.

Biography

Dr. Ioannis Ladas was born in Athens. He studied Theology at the University of Athens and Philosophy at the University of Patras. He holds master's degree in Philosophy and master's degree in Theology. He attended postgraduate courses in Theology at the Protestant School of the University of Charles in Prague and in Philosophy at the Bosphorus University in Istanbul. He holds PhD in Philosophy and PhD in Theology. His research activity focuses on the broad field of Applied Ethics, mainly Bioethics. Moreover, he has participated in European research programs and in World and International theological and philosophical conferences. He is a member, among others, of the Applied Philosophy Research Laboratory.

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Technical environmental efficiency in agricultural fertilizer management in the context of overinvestment - A case case study from Poland

Caring for the climate is a guarantee of providing good quality food (DaMatta et al. 2010; Vågsholm et al. 2020). Its changes can negatively affect agricultural productivity (Lobell and Gourdji 2012; Sarker et al. 2023) and, consequently, its profitability (Hertel and Rosch 2010; Suresh et al. 2021). One of the reasons for the negative impact of agriculture on the environment is the use of fertilizers and pesticides (Zmyślona et al. 2023), which, when used in excessive quantities, cause pollution that is harmful to the climate and ecosystem (Erisman et al. 2013). This is why sustainable food production is so important (Yetgin 2023). Analysis of the technical environmental efficiency of farms, or analysis of environmental issues using technical efficiency, has been used in studies by Cillero and Reaños (2023), Taoumi and Lahrech (2023), Adenuga et al. (2020), Kuhn et al. (2020) Adenuga et al. (2018), Reinhard et al. (2000), among others. Particularly relevant to the study at hand was the work of Cillero and Reaños (2023), who included a 4th factor in addition to the 3 factors of production in the production function as intermediate inputs. This paper focuses on the impact of fertilizer management on the environment through an analysis of technical environmental efficiency performed by stochastic frontier analysis using sfpanel in STATA 15 software, with a breakdown of the levels of overinvestment of farms in Poland determined by the author's method. Assessing the scale of the phenomenon of overinvestment is extremely important because of the ongoing changes in Polish and global agriculture where it is proving to be increasingly common (Guan et al. 2009, Staniszewski 2015). In the context of the efficiency of fertilizer management, one can point out the dependence of whether farms that are more overinvested, also apply fertilizers in an irrational way, which negatively affect the environment, and in the long run can reduce the quality of yields. A total of 3273 Polish farms were surveyed to analyze technical environmental efficiency. The panel data are from 2010-2019.

It was proved that the increase in efficiency in the last year in relation to T0 (2010 - the first year analyzed) occurred only in farms investing optimally and investing optimally without an increase in technical armament of labor. The highest decrease in technical efficiency was observed in farms overinvesting relatively. However, these are also the farms with the highest TE rate among the analyzed investment levels in most of the years studied. This state of affairs may be due to the fact that these are farms where both labor productivity and technical equipment are increasing, and they may be farms that invest optimally in the future. What is surprising is their large decline in technical efficiency. However, this may be influenced by unsustainable fertilizer management and unsustainable use of crop protection products. Underinvested farms had the lowest technical efficiency. Lack of investment also resulted in low environmental efficiency.

Audience Take Away Notes

- Recipients will learn what overinvestment in farms is and how it can be measured
- The study proposes a model in which, in addition to the 3 basic factors of production, there is a

4th, which in this case (agricultural production) is fertilizers and plant protection products. Other lecturers may also consider creating such a model

- The study combines agriculture, economics and environmental issues. This, in the context of increasing concern for the environment and at the same time rising production costs, is important for both researchers and practitioners. The presentation will contribute to research on farm investment as well as environmental economics

Biography

Jagoda Zmyślona is a Graduate of the Faculty of Economics at the University of Life Sciences in Poznan. Her doctoral dissertation entitled. "Overinvestment in Polish farms under the conditions of the Common Agricultural Policy" she defended on September 19, 2022. In her scientific research, she focuses on the phenomenon of overinvestment, as well as its impact on the obtained economic results. In addition, she analyzes the impacts of agricultural interventionism on the development of farms, as well as the achievement of general social goals. In 2018, she completed an internship at the European Parliament in Brussels.

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Potential of plasma-activated water use in agronomic practice and its effect on soil properties

In the field of agriculture, new ways of increasing yields but also less demanding on the environment are being sought. Current agricultural policy in the agrarian sector tends to reduce inputs in the form of various crop protection sprays or mineral fertilizers. Therefore, ways are being sought to meet this policy. One example is research into the application of Plasma-Activated Water (PAW). PAW contains significant amounts of chemically active species produced in plasma and at the plasma–liquid interface, especially Reactive Oxygen (ROS) and Reactive Nitrogen (RNS) species, together known as RONS. Some of the most important species appearing in the bulk liquid of PAW that might be involved in triggering cell mechanisms are OH, O, NO, NO2, H, H2O2, O3, NO2-, NO-, and ONOOH. Changes of chemical composition also led to the acidification of PAW. The extent of acidification and concentration of RONS is dependent on a variety of parameters such as plasma discharge type, discharge power density, formed plasma volume, used electrodes, activation time, initial water chemistry and water volume.

Interim research is mainly concerned with the effect of PAW on seed germination. Because PAW, depending on the treatment, is enriched with nitrogen groups and contains hydrogen peroxide, research into its application as a fertilizer or as a fungicide has been extended. However, this means that PAW comes into contact with the soil secondarily.

In cooperation between Mendel University in Brno and Brno University of Technology between years 2019 and 2024, about 10 laboratory experiments conducted focused on the effect of PAW on selected soil properties were carried out. These experiments used different soil types that are used for agricultural production in the Czech Republic. PAW was applied at very high doses to simulate long-term application to plants at lower doses. Soil properties monitored were soil texture, conductivity, soil reaction, water absorption. In some cases, different PAWs were used (depending on the production method), but always the reference was treated with distilled water only.

All the results obtained show that the application of PAW did not have a negative effect on the monitored parameters of soil. If negative changes were observed, they were like those of the control (distilled water) and therefore more likely to be attributable to the high dose of watering. This fact is positive for the possibility of incorporating PAW into agricultural practice.

Acknowledgement: This work was caused within COST Action CA19110.

Audience Take Away Notes

- Presenting an alternative for agricultural practice in fertilizer and plant protection more environmentally friendly

- Demonstration of our results in laboratory conditions
- Possibility of establishing research cooperation in this area

Biography

Dr. Jana Šimečková work at Mendel University in Brno, Department of Agrochemistry, Soil Science, Microbiology and Plat nutrition at Faculty of AgriScience. She focuses on the study of soil properties, soil health after addition of substances, soil classification. She finished her Ph.D. study in 2019 at Mendel University in Brno with thesis focused on the change of soil properties after addition different fertilizers (digestate, manure, mineral fertilizer) in field condition. Shea has published 14 research articles with more than 120 citations.

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OsPHYB mediates dim-light reduced insect resistance by promoting ethylene biosynthesis and signaling in rice

Increasing planting density is one of the most effective ways to improve crop yield. However, one major factor that limits crop planting density is the weakened immunity of plants to pathogens and insects caused by Dim Light (DL) under shade conditions. The molecular mechanism underlying how DL compromises plant immunity remains unclear. Here, we report that DL reduces rice resistance against Brown Planthopper (BPH) by elevating Ethylene (ET) biosynthesis and signaling in an OsPHYB-dependent manner. The DL-reduced BPH resistance is relieved in osphyB mutants, but aggravated in OsPHYB overexpressing plants. Further, we found that DL reduces the nuclear accumulation of OsphyB, thus alleviating the degradation of OsPIL14, consequently leading to the up-regulation of OsACO1 and an increase in ET level. In addition, we found that nuclear OsphyB stabilizes OsEIL2 by competitively interacting with OsEBF1 to enhance ET signaling in rice, which contrasts with previous findings that phyB blocks ET signaling by facilitating the degradation of EIN3 in other plant species. Thus, enhanced ET biosynthesis and signaling reduces the BPH resistance under DL conditions. Our findings provide new insights into the molecular mechanism of light regulating ET pathway and host-insect interactions and potential strategies for sustainable insect management.

Audience Take Away Notes

- Why are crops susceptible to pests and diseases under shade conditions?
- How does light affect brown planthopper resistance in rice?
- How does phyB affect rice brown planthopper resistance by regulating ethylene synthesis and ethylene signaling?
- The audience will learn how to identify rice resistance to brown planthopper under the influence of environmental factors

Biography

Dr. Jie Huang studied Horticulture at the Shenyang Agricultural University, Shenyang China and graduated as MS in 2013. He then joined the research group of Prof. Jianmin Wan at the Institute of State Key Laboratory of Crop Genetics and Germplasm Enhancement, Province and Ministry Co-sponsored Collaborative Innovation Center for Modern Crop Production, Nanjing Agricultural University, Nanjing, China. He received his PhD degree in 2022 at the same institution. He then joined Zhang Jian research team at the China National Rice Research Institute as an assistant researcher. He has published more than 70 research articles in SCI(E) journals.

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Economic and productive impact of the implementation and use of agricultural irrigation in the state of Tabasco, Mexico

Objective: Three support programs for agricultural irrigation in 8 municipalities in the State of Tabasco were evaluated for a total area of 972.4 ha with 7 crops per municipality. One production cycle was used for the evaluation of the irrigation units in the State of Tabasco.

Design/Methodology/Approach: The software "System for the Evaluation of Irrigation Units" SISEVUR 3.0 was used for the integration and evaluation of a) general operation of infrastructure; b) producer satisfaction with the infrastructure; c) aspects of improvement in the quantity and quality of production; d) benefits of irrigation on agricultural production and suggestions and opinions of producers regarding hydro-agricultural programs e). The economic/financial evaluation.

Results: The crops that responded best to the application of irrigation were: 1) forage corn, with an increase in production of 140.7%; 2) lemon with 97.98%; 3. banana with 58.6%, and 4 sugar cane with 41%.

Limitations on Study/Implications: Data collection required several visits to the producer to improve the collection of reliable data. However, there is a margin of error that could not be quantified due to the particularities of the producers and the work.

Findings/Conclusions: Bananas and citrus improved production quality and product maintenance throughout the year, favoring supply and demand commitments in the domestic and international markets.

Keywords: Irrigation, Water Efficiency, Evapotranspiration, Agricultural Productivity.

Biography

PhD. Jose H. Rodolfo Mendoza Hernandez. He studied for a degree at the Chapingo Autonomous University, Mexico, he is an Agronomist Engineer in Irrigation, he studied a Master of Science at the College of Postgraduates, Mexico; He obtained a PhD from the Polytechnic University of Cartagena, Spain. Since 2006 he has been a Research Professor at the Colegio de Postgraduados, Mexico. Most important publications of PhD Mendoza Hernandez are: El Riego inteligente; Radio de influencia, calibracion y aplicacion de los sensores FDR de medida de humedad; Sustainability of agricultural production under irrigation; Estimating evapotranspiration by capacitance and neutron probes; Soil water content measured by FDR probes in peach trees; Effect of supplementary irrigation on the transpiration of oil palm trees during the dry season.

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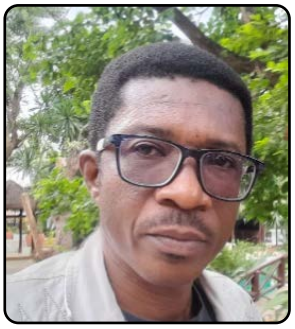
Morphological characterization of mamey fruits (*Pouteria sapota (Jacq.) H. E. Moore & Stearn*) in Cuetzala del Progreso, Mexico

The mamey [Pouteria sapota (Jacq.) H. E. Moore & Stearn] has high potential for commercial exploitation; however, to date the plantations in Cuetzala del Progreso, Mexico, are characterized by having native trees, and their dissemination has been mainly by seed, thus generating a wide genetic diversity. The objective of this research was to morphologically characterize, based on fruit and seed parameters, 29 accessions of mamey sapote from Cuetzala del Progreso, to identify those with the best outstanding characteristics. Morphological variables were evaluated: weight, diameter and thickness of the fruit, thickness of the epicarp and mesocarp, number of seeds, weight, length, width and thickness of these, firmness, °Brix, color of the epicarp and mesocarp. Through a multivariate clustering analysis, three groups of accessions were detected; a discriminant analysis corroborated the relevance of these groups and showed that the groupings were based mainly on characteristics related to physical and hedonic quality. Thus, qualities of interest with opportunities for use for the genetic improvement of fruit morphology were identified in the populations.

Audience Take Away Notes

- The importance of the crop and the traits to determine its fruit quality. This information can be used to introduce this crop in other places
- To know the alternatives to identify the best accessions according with fruit parameters and later use this information in a plant breeding program

Biography
Juan Martínez Solís has a MSc in Plant Genetics and PhD in Horticulture. He was plant breeder from 1985 until 1989. From 1990 he is professor assistant in Chapingo University, Mexico, where he has been working in several topics like a seed science, vegetable production and molecular markers. He has more than 45 papers published in either Mexican or International Journals (https://orcid.org/0000- 0003-4080-1286). In the past ten years he has been collaborating with the researchers in ornamental and fruits crops, particularly in topics related with production, molecular and morphological characterization, and postharvest management. Juan is member of several scientific association in Mexico, Europe and South America.



Dr. Kofi Frimpong-Anin*, Blankson, W. Amoabeng, Ernestina N. Awarekabey, Atta Aidoo Snr., Jerry F. Asamoah, William L. Kota, Stephen Arthur, Patrick Obeng, Mary Gyamfi, Augustine Agyekum, Grace Bolfrey-Arku, Moses B. Mochiah

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Insect pest population dynamics of lowland rice in the forest belt of Ghana

Ghana is striving to be self-sufficient in rice and acreages cultivated to rice are rapidly expanding. Rice intensification, like most monocultures, has increased pest outbreaks as being experienced in some rice growing areas. Insect pest populations over rice growth cycle were monitored over 2 years in 108 rice fields in 9 key rice growing communities in Ashanti Region. Insect pests were sampled using sweep net, and direct observation along transect from nursery to physiological maturity stage. Deadheart rice plants were counted as indirect incidence of stem borers. Samples of rice deadhearts with live larvae were also incubated in the laboratory until moth emergence. A total of 29 insect pest species were identified, of which 13 were considered major pests. The major insect pests were the stem borers Chilo zacconius, Scirpophaga sp, Maliarpha separatella, Nymphula sp., Diopsis thoracica; leave beetles Chnootriba similis, Xanthadalia sp., Lema sp., Chaetocnema sp., Dicladispa viridicyanea and sucking bugs Leptocorisa sp, Riptortus sp. Aspavia armigera. The leafhoppers Nephotettix modulates, Cofana spectra, Cofana unimaculata were prevalent but were not considered major pest because no rice leafhopper burn associated with them was recorded. They could however be important in fields where yellow mottle virus disease was recorded, since they and leaf beetles are vectors. Population densities of all the major pests, except Riptortus sp., peaked at the tillering/ stem elongation stages. Although rice leaf beetles occurred in all surveyed areas, species distribution differed among locations. Nymphula sp. seems to be endemic in some locations, as these areas recorded consistently high incidence especially under flood conditions. The mean incidence of deadheart was 8.2% while leaf damage by caseworm and leaf beetles was 11.42% incidence and 2.3 severity. Major insect pests and population build up at different growth stages of rice in the study area is understood and can form basis for the development of IPM package for rice production.

Audience Take Away Notes

- Overview of suite of insect pest incidence at different growth stages of rice
- Observation offers basis for the design of integrated pest management plan for smallholder rice farmers
- Outlines the primary insect pests of importance, which makes it easier for pest managers to prioritize. Thus, in this ecological zone, management should focus on stem borers and leaf feeding beetles (which are major vectors of rice yellow mottled virus)
- Training of farmers on proper identification of these pests will help early detection and reporting of any new invasive alien pest

Biography

Dr. Kofi Frimpong-Anin is a product of the Africa Regional Postgraduate Programme in Insect Science (ARPPIS), A PhD fellowship in insect science. He obtained both his PhD and MPhil in Entomology from the University of Cape Coast, Ghana, after his Bachelor of Science in Zoology from University of Ghana. He is currently a senior research scientist with wealth of experience in both horticultural and cereal insects. His primary interest hinges on the application of ecological solutions in the management of crop pests and promotion of pollination services. Thus, he adopts integrated pest and pollinator management strategies, even when working on non-pollinator dependent crops.

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Harnessing native bioagents for sustainable management of fall armyworm *Spodoptera frugiperda*

Exploitation of biological agents in the management of the invasive fall armyworm is considered the most sustainable strategy. This is particularly important for sub-Saharan Africa, where smallholder farmers form majority of staple food producers. A field study was thus conducted to assess the effectiveness of simultaneous deployment of a parasitoid Telenomus remus (Hymenotptera: Pterigydae), and native entomopathogenic fungi Bauveria bassiana and nematode Metarhabditi ranai in managing fall armyworm Spodoptera frugiperda (Lepidoptera: Noctuidae). T. remus was released on 4 weeks old maize followed by application of B. bassiana and M. ranai after 24 hours. Treatments were sole T. remus, T. remus+B. bassiana, T. remus+M. ranai and T. remus+B. bassiana+M. ranai. Egg mass parasitism, larval mortality, incidence of S. frugiperda infestation, leaf and cob damage, and yield were assessed. FAW egg mass parasitism were similar across sole T. remus, T. remus+B. bassiana, T. remus+M. ranai and T. remus+B. bassiana+M. ranai treatments. Larval mortality of S. frugiperda 72 hours after treatment with the entomopathogens was similar among parasitoid and entomopathogen combinations, and these were higher than sole parasitoid. Maize leaf damage and new infestation by S. frugiperda significantly reduced and remained low after deploying the native bioagents. Maize cob damage at harvest and yield were not different among sole parasitoid and parasitoid+entomopathogen combinations. The parasitoid T. remus can be complemented with either entomopathogenic nematode M. ranai or entomopathogenic fungi B. bauveria as part of integrated management of S. frugiperda in maize.

Audience Take Away Notes

- There is always local alternative solutions to effectively manage insect pests including the invasive fall armyworm
- There are native biocontrol options that can form a formidable component of IPM strategy against the fall armyworm
- Exploring innovations from famer's cultural practices can give researchers a head start
- Sustainable management of fall armyworm can be achieved by combining natural enemies and entomopathogens in a thought through management programmes

Biography

Dr. Kofi Frimpong-Anin is a product of the Africa Regional Postgraduate Programme in Insect Science (ARPPIS), A PhD fellowship in insect science. He obtained both his PhD and MPhil in Entomology from the University of Cape Coast, Ghana, after his Bachelor of Science in Zoology from University of Ghana. He is currently a senior research scientist with wealth of experience in both horticultural and cereal insects. His primary interest hinges on the application of ecological solutions in the management of crop pests and promotion of pollination services. Thus, he adopts integrated pest and pollinator management strategies, even when working on non-pollinator dependent crops.

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Integrating ethno-climatology knowledge to enhance climate resilience in organic tea cultivation: A case study of Sri Lankan tea smallholders

The sustainable cultivation of organic tea is facing a grave challenge in the form of climate change, which has led to a host of negative impacts on tea production. In order to mitigate these impacts and ensure the continued viability of organic tea cultivation, swift and effective adaptation measures are urgently required. Ethno-climatology is a multidisciplinary field that investigates the relationship between human societies and climate, examining how cultures and communities perceive and interact with climate and weather patterns. This study aimed to evaluate the level of ethno-climatology knowledge among organic tea smallholders in the Uva High Grown region of Sri Lanka and assess their degree of adaptation measures to improve climate resilience. Data was collected through interviews, questionnaires, focus group discussions, and surveys, with a sample size of 100 smallholders. The results showed that over half of the smallholders demonstrated a significant level of awareness concerning ethno-climatology, with approximately 37 exhibiting a high level of awareness. The multiple regression model used in the study had a strong fit, accounting for 96.2% of the variance in the dependent variable. The analysis revealed that variables such as age, experience in organic tea cultivation, knowledge gained through experience, observations, beliefs, and cultural practices played pivotal roles in shaping smallholders' awareness and understanding of ethno-climatology. Conversely, the variables related to education and the number of information sources showed weak or non-significant relationships with awareness levels. The findings suggest that policymakers should focus on developing strategies to increase smallholders' awareness of ethno-climatology practices and provide support for the application of long and mid-term climate resilience adaptive strategies. Overall, this research provides valuable insights into the existing understanding of ethno-climatology and the adoption of adaptation measures in climate resilience within an organic tea ecosystem.

Keywords: Climate Resilience, Ethno-Climatology, Organic Tea Cultivation, Awareness Level, Mitigation Measures.

Biography

Dr. Lalith Amathunga Head/Department of Export Agriculture, Uva Wellassaa University of Sri Lanka, is a dedicated Agricultural Extensionist and environmentalist graduated as B.Sc. Agriculture from University Ruhuna in 1987 and he obtained his Master's degree of M.Sc. Environmental Science from the University of Colombo in 2000 specializing in the impact of climate change on tea productivity. He doctored in the field of Agricultural Extension specializing in Public-Private Partnership Extension in the tea sector from the University of Peradeniya in 2015. He worked as a Senior advisory officer at Tea Research Institute in 1991-2010 and as Senior Manager of Tea Extension at John Keells Group in 2011-2020, and currently working as a Senior Lecturer in Uva Wellassaa University of Sri Lanka.

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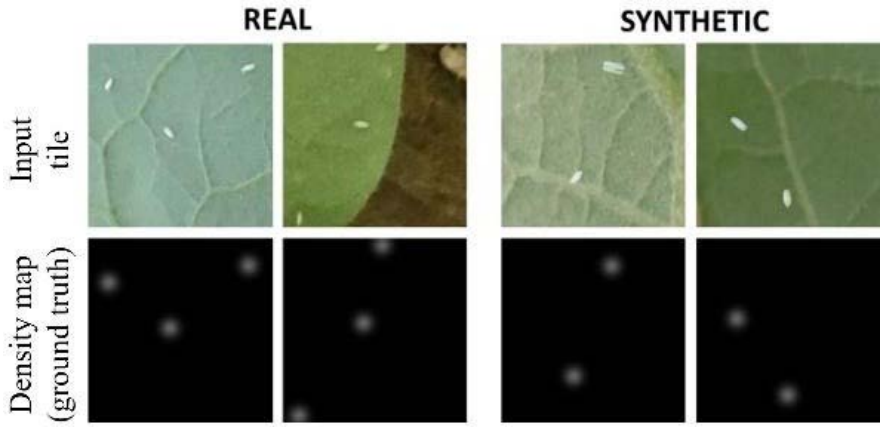
Synthetic imaging for whitefly counting with few annotated real data

Counting insects in plants has many applications, such as the development of new insecticides. Deep learning has allowed to develop robust automation of the insect counting in images of leaves by density map estimation.

However, deep learning requires many annotated data. The annotation for insect counting is very time-consuming as precise location of all the insects must be indicated. We present a method that drastically reduces the annotation effort for training an insect counting model by creating many synthetic images and their annotations from very few real annotated data. The method is validated for whitefly counting in eggplant leaves.

This whitefly counting model is trained with leaf tiles of 256x256 infested with whiteflies. These synthetic tiles are created by, first, extracting whiteflies from 16 real annotated images of a complete leaf using the known whitefly location and classical image processing techniques for segmentation. Then, the extracted segmented whiteflies are visually inspected to discard blurred or poorly segmented ones. Finally, 50000 synthetic tiles are generated by pasting the extracted whiteflies in random tiles cropped from 59 images of clean eggplant leaves.



To validate this method, whitefly counting models are trained: a) only with tiles extracted from the 16

annotated real images; b) only with the 50 000 synthetic tiles and c) with both the real and synthetic tiles. The models are tested with 50 real annotated images. The process is repeated 5 times for different train and test subsets and the "median (interquartile range)" of the Mean Average Error (MAE) and the coefficient of determination (R2) are reported. The inclusion of the synthetic tiles greatly improves the results as it provides variability to the training data.

	MAE	R2
Only real	17.84 (10.08-25.76)	0.06 (0.03-0.41)
Only synthetic	8.64 (5.42-10.28)	0.78 (0.38-0.85)
Real + synthetic	3.78 (3.11-4.97)	0.85 (0.68-0.95)

Audience Take Away Notes

- The boost that deep learning has given to machine vision in order to make possible to digitalize and automatize complicated and time-consuming tasks such as counting insects in plants to measure the pest level
- The big obstacle that is for the development of robust deep learning models the difficult availability of manually annotated data to train them, as the manual annotation task is usually very time-consuming and requires expert knowledge in the field
- The big positive influence that the generation of synthetic annotated data has to get robust deep learning models requiring few manually annotated real data
- The demonstration of the previous statements for a real use case of counting whiteflies in images of eggplant leaves taken in the wild. The synthetic images allow to drastically reduce the effort needed to get a deep learning model that counts the whiteflies with very good performance

Biography

Laura Gómez-Zamanillo Graduated in Telecommunication Engineering (2017) at Bilbao School of Engineering (UPV/EHU) obtaining the Extraordinary End of Degree Award. She got her Master's degree also in Telecommunication Engineering (2019) at the same university. She currently works as a researcher the Computer Vision research group at Tecnalia. She works developing deep learning models oriented to computer vision for the digitalization of agricultural processes for multinational companies such as BASF. She is also currently working on her PhD oriented to methods for reducing the annotation effort for developing deep learning models. She is mainly focused on semi-supervised techniques and synthetic image generation. She holds 4 European and International patents and 3 publications.

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A review on Bombyx mori: Microbial, viral and parasitoid diseases, detection and control

The mulberry silkworm, Bombyx mori, is the most dominant and economically important domestic silkmoth in sericulture farming. It produces the best quality of silk fibers owing to its desirable traits of a much larger progeny size, short life span, and low maintenance cost. However, Bombyx mori is being infected with several diseases throughout the year, especially during rainy and winter seasons that cause severe crop losses to farmers. Diseases in mulberry silkworms are caused by fungi, microsporidians, bacteria, viruses, and parasitoids. Muscardine is caused by fungal pathogens.which include Beauveria bassiana, Metarrhizium anisopliae, Aspergillus flavus, A. tamarii, and Nomuraea rileyi. The highly fatal pebrine is caused by Microsporidium sp., Nosema bombycis, Pleistophora sp., Thelophania sp., and Vairomorpha sp. Bacterial infections are caused by Streptococcus faecalis, S. faecium, Serratia marcescens, Staphylococcus, and Bacillus thuringiensis. Viral pathogens causing flacherie and grasserie are the B. mori nucleopolyhedrovirus (BmNPV), B. mori densovirus (BmDNV), B. mori infectious flacherie (BmIFV), and

B. mori cytoplasmic polyhedrosis virus (BmCPV). There are also a few parasitoids Exorista bombycis and dermestid beetle that lay eggs on silkworm larvae and cocoons, respectively. Contaminated rearing houses is the most common route of fungal conidia on the silkworm body causing white or green muscardine. Whereas microsporidia infect the silkworms with the lethal pebrine through transovarian transmission, consumption of contaminated mulberry leaves, contaminated rearing houses and appliances. B. mori gets infected with flacherie and grasserie viruses upon feeding on contaminated mulberry leaves, fecal matter and body fluids that come in contact with skin injuries or wounds. Several efficient approaches are being conducted for disease monitoring, early diagnosis and control of these silkworm diseases. Microscopic examinations and histopathology are the usual methods being employed for initial diagnosis of silkworm diseases. However, it may not be practical for viruses. A more reliable and accurate method to detect viral and microsporidian diseases is the use of antigen-antibody serological testing. This includes enzyme-linked immunosorbent assay (ELISA), immunoblotting, precipitin, fluorescent antibody and the commonly used dipstick assays. Meanwhile, Digital gene expression (DEGs) profiling or transcriptome analysis is a molecular approach to screen activated genes silkworm for its early response to Beauveria bassiana. Since there is no effective strategy for treating muscardine, infected silkworms must be disposed or burned immediately. Chemotherapy by feeding fungicides to the infected 2nd instar silkworms are proven effective in containing muscardine and microsporidiasis. B. mori infected with Bacillus thuringensis can be treated with botanicals such as Ocimum basilicum, Morus alba, and Nigella sativa to reduce larval mortality rate and an additional advantage of increased weight of the larva, cocoon weight and cocoon shell. Nevertheless, since there is no single approach to effectively eradicate this deadly B. mori diseases, immediate isolation of the infected and diseased larva should be done, continuous disinfection of the rearing facilities, control of mulberry pests, and proper sanitation should be observed throughout silkworm rearing. It is imperative to observe strict management practices in sericulture farming since preventive measure is the only key for a disease-free B. mori silkworm larva.

Audience Take Away Notes

- The academe, farmers, agriculturists and researchers will be updated on the complete incidence and diagnostic tools of the various lethal Bombyx mori diseases.
- Sericulture farmers may adapt the efficient management practices being done by every country in their respective rearing facilities.
- In the academe, both the faculty and students can explore the molecular mechanisms involving gene expressions in Bombyx mori in their response to various fungal, microbial, viral, and parasitoid pathogens.
- This will serve as a baseline information to improve the detection, diagnosis, and treatment of Bombyx mori infections.

Biography

Dr. Libertine Rose S. Sanchez studied BS Botany at the University of Santo Tomas and graduated as MS Biology at the Ateneo de Manila University studying the Fusarium oxysporum causing banana wilt. She received her PhD Biology specializing in Plant and Cyanobacterial Genetics at the University of the Philippines Diliman (UPD) and attended the NGS courses at the European Molecular Biology Laboratory in Heidelberg, Germany. Her dissertation was about the Metagenomic Analysis and Screening for Metal Response Genes of Cyanobacteria where she also had a postdoctoral fellowship establishing the cyanobacterial culture collection. Another Postdoctoral Fellowship under the Department of Science and Technology (DOST)-Science Education Institute at the UPD-NIMBB and conducted research on the Biobanking and DNA barcoding of green microalgae. She is currently at the DOST-Philippine Textile Research Institute conducting research on silkworm genomics.

Leila Rossa Mouawad[1*], Salim Kattar[1], Jad Rizkallah[1], Samara El Haddad[2], Karma Bou Azza[2], Dany El Obeid[1]

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The status of the Eurasian hoopoe (*Upupa epops*) in Lebanon and its effect on the pine processionary caterpillar infestations

The Pine Processionary Moth (PPM) (Thaumetopoea wilkinsoni) has long been attacking Mediterranean Pine forests. In its management strategy, Lebanon has focused mainly on pesticides, leaving natural predators as an understudied control option. Moreover, there is an inherited lack of accurate forest inventory, biological diversity assessment and a broad gap when it comes to avifauna and its link as a natural control of forest pests and widespread defoliators. This study aims to understand the distribution and status of the Eurasian Hoopoe (Upupa epops), by assessing the damage caused by the PPM with an arbitrary continuous index ranging from 0 (no damage at all) to 1 (all the trees are severely damaged). We attempted to explain the distribution of the two species, their relation to other factors and, with a Citizen Science (CS) approach, we developed their distribution maps covering the years 2017 to 2022. Data were collected from various sources: 1) a Google Form shared nationally among individuals, groups, NGOs, pages, ministries and more; 2) Passive data collected from Facebook groups and individual posts; 3) Personal communication with key people, namely hunters, bird-watchers, photographers, hikers, and scientists; and 4) eBird, an online database programme, where users contribute to science by entering accurate data about their bird observations. After filtering the data to keep only the ones that behold complete information, a unified database was developed. The latter was used to create distribution maps on ArcMap and conduct an independent samples t-test comparing the varying PPM damage per Cazas, between two groups (within or outside IBA). We found that the varying PPM damage between cadastral units was linked to Important Bird Areas (IBAs), as the PPM damage was higher in areas with less birds and lower in IBAs. This finding highlights the importance of multiple birds, including the Eurasian Hoopoe, as natural predators of this pest and calling for their conservation. As understudied species in Lebanon, this paper sets the path and offers guidelines for future researchers willing to work on similar crucial research in a climate change context and reveal the underlying relation between the two species.

Audience Take Away Notes

- Gain insights on the role of birds as natural predators of forest pests
- Learn how to replicate study in a similar context and reach more significant results
- Benefit from policy recommendations to build on and push for reforms
- Build on findings to guide the development of management plans

Biography

Leila Rossa Mouawad studied forestry at the Lebanese University and currently works as a researcher at the American University of Beirut-Nature Conservation Center where she engages in multidisciplinary projects. Through her educational background and current work in the environmental field, Leila is deeply committed to biodiversity conservation at the national, regional and global level. With over five years of experience in forest communication, Leila actively participated in various international forums to represent youth and support scientists in effectively communicating their complex messages to a wider audience.

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The role of catch crop in improving soil fertility and plant nutritional status in boreal climates of Lithuania

In Lithuania, due to short seasons after harvesting, low temperature or lack of moisture during germination, it is not always possible to grow valuable Catch Crop (CC). Agronomic practices related to CC should therefore be adapted to the specific soil and climatic conditions of the region. We hypothesize that the optimization of CC technologies, taking into account the applied agronomic practices, can partially reduce the negative influence of meteorological conditions and increase the efficiency of CC. The research aims to clarify the impact of post-sown cover crops management on their biomass, accumulated Nitrogen (N), Phosphorus (P) and to determine environmentally safe methods of biomass utilization/incorporation.

The implementation of this study contributed to the development of Lithuanian science and the complex solution of problems of agricultural beneficiaries. During the implementation of the study, 10 (ten) field trials were installed in the farmers' and LAMMC arable lands (2022-2023) according to a wide range of methodological materials, reflecting Lithuanian agro: soil characteristics, farming practices and farm specialization. Three types of catch crop mixtures were studied for the purpose of influence: frost-free and fallow (for direct sowing in spring), mixture of multispecies crop (to increase the vitality of the soil) and a mixture of Brassicaceae plants (to reduce the amount of mineral N in the soil, remaining after abundant fertilization of the crop with N fertilizers). Studies have shown that the biomass of catch crop mixtures grown in various regions of Lithuania was determined by the time of sowing, the amount of moisture in the soil at the time of plant germination (or precipitation) and the average daily temperature during the autumn period. According to research data, intercrops in different pedoclimatic conditions accumulated unequal amounts of N and P in the biomass. The amount of N accumulated by the catch crop was directly correlated with aboveground biomass yield. The amount of mineral N in the soil was determined by the species composition and yield of the plants in the mixture. Deeper soil layers (30-60 cm) are reached by the roots of Brassicaceae plants with biomass >2 t ha-1 DM. Research results showed that the direct sowing of CC in the spring increased the yield of spring wheat grains from 2.9 to 13.1% in the lighter granulometric composition soils of Central and Western Lithuania, compared to the incorporation of biomass in autumn. At that time, in heavier soils (Northern Lithuania region), the biomass of catch crops incorporated in autumn increased the yield of spring wheat grains more (14.3-21.7%) than that introduced in spring. Studies have shown that the yield of spring wheat depended on the mass of CC inserted, its quality, the time of decomposition (autumn or spring), soil and meteorological conditions. Rolling promoted complete freezing of CC and better-preserved nutrients until spring.

Audience Take Away Notes

- The generated research data will significantly enhance the understanding of catch crop cultivation technologies and their environmental benefits. By implementing modern post-autumn period technologies, farmers can expect practical advantages, such as improved soil fertility and stabilized

farm income. These advancements in agricultural practices not only support sustainable farming but also contribute to environmental protection by optimizing the use of natural resources and reducing the ecological footprint of farming activities

Biography

Dr. Šarūnaitė has a academic and research background in Agronomy. She completed her Master's degree in Agronomy from the Vytautas Magnus University Agriculture Academy in Lithuania in 2001. Following her graduation, she joined the Lithuanian Research Centre for Agriculture and Forestry (LAMMC), where she furthered her studies and research, ultimately earning a PhD degree in 2007. She has published 20 articles in journals that are indexed in the WOS database. Additionally, she has contributed 54 articles to scientific peer-reviewed journals and authored 20 popular science publications, reflecting her commitment to both scientific advancement and public engagement. Her professional development is also marked by international experience, having completed internships in Denmark and the USA. These opportunities have likely enriched her research perspective and expertise, fostering international collaboration and knowledge exchange in the field of agronomy.

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Characterization of ntwoolly and NtRAX2-like, two transcription factors involved in the development of glandular trichomes of *Nicotiana tabacum*

Trichomes, the epidermal outgrowths found on most aerial plant tissues, are prevalent in a vast number of plant species and can be glandular or non-glandular. As multicellular structures that develop post-embryonically, glandular trichomes serve as an excellent model for investigating fundamental aspects of cell development, such as cell fate determination, cell cycle control, division and polarity, differentiation, and cell-to-cell signaling. Despite their importance, there is a significant knowledge gap regarding the regulators of glandular trichome formation and patterning in the leaf epidermis, specifically those governing entry into the glandular trichome cell fate and progression through its developmental pathway.

In this study, we focus on the functional characterization of NtWoolly, a HD-ZIPIV transcription factor, and NtRAX2-like, an R2R3 MYB transcription factor. Both genes are specifically expressed in the protoderm (developing epidermis) of leaf primordia, with their expression ceasing in mature leaves. Notably, we discovered that NtRAX2-like and NtWoolly physically interact, suggesting that their heteromerization may promote glandular trichome development.

To explore their roles, we performed DAP-seq analysis on both transcription factors, revealing numerous shared direct transcriptional targets, which underscores their potential common transcriptional activation pathway. Among these targets are key regulators known for their involvement in trichome development in other plant species. Additionally, we utilized reverse genetics to generate overexpressing and knockout lines for both transcription factors, yielding significant results in terms of trichome density and the chemical composition on the surface of tobacco leaves.

These findings highlight the role of NtWoolly and NtRAX2-like as a transcriptional complex regulating the early stages of glandular trichome development in Nicotiana tabacum.

Audience Take Away Notes

- This research provides valuable insights into the specific mechanisms underlying the development of glandular trichomes, which are critical for various plant functions, including defense against herbivores and pathogens. By uncovering the roles of key transcription factors and signaling pathways, this study advances our understanding of how these specialized structures form and function
- From a broader perspective, the research elucidates key factors involved in the differentiation of protodermal cells into complex specialized structures. This knowledge not only enhances our comprehension of trichome development but also sheds light on fundamental processes of cell differentiation and specialization in plants. Additionally, the sequencing analysis conducted in this study offers methodological expertise that can be beneficial to other research groups working on

similar topics. This aspect of the research provides a framework for exploring gene expression and regulatory networks in plant development. The reverse genetics approach utilized in this research will be of particular interest to those studying plant development and transcription factors. By manipulating specific genes and observing the resultant phenotypic changes, this approach helps to identify and characterize the functions of genes involved in trichome formation. In the long term, the findings from this work could contribute to the development of crop lines with enhanced resistance to pathogens and herbivores. The increased production of glandular trichomes, as facilitated by the insights gained from this research, could improve the plants' ability to withstand biotic and abiotic stresses, ultimately leading to more resilient agricultural systems

Biography

Louis Gueuning earned his degree in bioengineering with a focus on chemistry and bioindustries from UCLouvain (Belgium), graduating in 2020. During his studies, he conducted his Master thesis under the supervision of Prof. Charles Hachez at the Louvain Institute of Biomolecular Science and Technology (LIBST), where he researched trichome development in Nicotiana tabacum. Following his Master degree, he continued his research in the same group as a PhD candidate. Currently in his fourth year of PhD thesis, he is preparing to defend and publish his dissertation soon.

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Barley strigolactone-signalling mutant HvD14.D presents highly-tillered phenotype due to hormonal network alterations

Plants architecture is continuously adjusted to environmental changes to optimize their growth and development. The regulation of plant branching, influenced by environmental conditions impacting hormone balance and gene expression, is crucial for agronomic purposes due to its direct correlation with yield. A well-branched crop typically produces more flowers, fruits, or grains, resulting in higher yields at harvest time. Therefore, research on branching has become a popular topic worldwide.

Strigolactones (SLs), the youngest class of phytohormones, primarily shape the architecture of plants. Barley plants harbouring the mutation in the HvDWARF14 (D14) gene, which encodes the SL-specific receptor, produce almost twice as many tillers as Wild-Type (WT) plants Sebastian. Here, through hormone profiling and comparison of transcriptomic and proteomic changes between two-week-old and four-week-old tested genotypes, we elucidate the regulatory mechanism that might affect the tillering of SL-insensitive plants.

The analysis showed statistically significant increased cytokinin content and decreased auxin and abscisic acid content in our 'bushy' hvd14.d compared to WT, which aligns with the commonly known actions of these hormones regarding branching regulation. The hormone profiling also indicates altered content of jasmonic acid and salicylic acid. The transcriptomic and proteomic analysis revealed in total 181 and 1127 Differentially Expressed Genes (DEG) and Differentially Abundant Proteins (DAP) in hvd14.d two- and four-week-old plants when compared to the WT. Functional annotation of these dataset showed that 11,6% for younger plants (21/181) and 14,6% for older plants (165/1127) of transcriptomic and proteomic changes are associated with phytohormone-related processes. However, some of the identified genes/proteins were annotated to more than one term linked to phytohormones. Most of DEG and DAP are linked to ABA and JA, which aligns with results obtained after phytohormone content measurement. Next, bioinformatics analyses allowed identifying strigolactone-dependent Transcription Factors (TFs) that may control the differences observed in the hvd14.d transcriptome and proteome. Moreover, comparison with data available for Arabidopsis thaliana allowed us to select TFs that may be involved in the transduction of strigolactone signal in both monocotyledonous and dicotyledonous plants.

Audience Take Away Notes

- The role of strigolactone in plant growth and development
- The bioinformatic approach of analyzing genes with the open access tools
- The set of TF which might regulate SL-dependent genes
- Interactions of SL with other phytohormones in shoot branching

Biography

MSc Magdalena Korek studied Biotechnology at the University of Silesia, Katowice, and graduated in 2021. During her master's thesis, she focused on epigenetic mechanisms involved in the regulation of gene expression during the somatic embryogenesis process in Arabidopsis thaliana. In the meantime, she participated in a student internship where she was responsible for describing potentially pathogenic genetic variants obtained after human DNA next-generation sequencing. She then joined the research group 'Plant Genetics and Functional Genomics' led by DSc Daszkowska-Golec and worked with Hordeum vulgare, a model plant among crop plants, focusing on the newest class of phytohormones, strigolactones. Her doctoral dissertation is related to the crosstalk in strigolactones and abscisic acid signaling pathways and is supervised by DSc Marek Marzec.

Dr. Mallikarjuna Muddappa*, U.Satishkumar, Ibrahim Kaleel
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Determination and assessment of morphometric analysis of Hirerayanakumpi sub-watershed in Krishna river basin of Raichur district, Kalyana-Karnataka, India using DEM and GIS techniques

The quantitative morphometric analysis of the present research study was taken up in the Hirerayanakumpi sub-watershed, Deodurga Taluka, Raichur district, Kalyana-Karnataka, India at 160 23'18" North latitude and 770 09' 29" East longitude. The drainage network of sub-watershed was delineated and the parameters required for morphometric analysis are computed using by QGIS 2.6.1 and as well as ArcMap10.8.2 software's. Various linear, relief and areal morphometric parameters such as area, perimeter, stream order, stream length, stream number, bifurcation ratio, drainage density, stream frequency, drainage texture, length of basin, form factor, circulatory ratio and elongation ratio are calculated. The drainage pattern of the study area is dendritic with stream order 5th (V) and lower streams order conquered in the selected watershed. The geometry of streams shows dendritic drainage pattern associated with coarse drainage texture in primary order of streams present on hill-terrain surface and semi-dendritic pattern in higher stream order flow on less elevated surface with gentle slope. The drainage density of the study area ranges from 0.20 to 2.50 km/km2, and the maximum density value was found along the higher stream order. The mean bifurcation ratio of this area is 4.01 and the high ratio was measured between the third and fourth order of stream segments. Furthermore, the sub-basin is found to be strongly elongated in shape with a length of 30.27 km, and the circularity ratio of this area is measured as 0.48 and elongation ratio as 1.10. The values of form factor and circulatory ratio of watershed indicate that the watershed is approaching towards the fern shape. The values of length of overland flow of the watershed indicate that the areas are associated with high runoff and less infiltration. The low value of ruggedness number indicates that watershed is having gentle slope. The research of morphometric analysis study helps to plan the selection and adoption of the soil and water conservation measures and the crop management practices in the prospect. Morphometric analysis helps to understand the geo-hydrological characteristics of the watershed. It is inevitable in development and management of drainage basin.

Keywords: Areal, Geomorphologic, Linear; Morphometric, Relief, Sub-Watershed.

Audience Take Away Notes

- Assess the impact of watershed planning through case studies
- Develop control and mitigation techniques for watershed problems
- Understand the concepts of watershed management and its effect on Soil and Water and natural resources

Biography

Dr. Mallikarjuna Muddappa studied B.Tech. (Ag.Engg.) from University of Agricultural Sciences, Raichur-584104, Karnataka in 2010. He joined in for M.Tech. (SWCE) with ICAR-Junior Research Fellowship at Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra completed master degree in 2012 and the Doctoral degree Ph.D.(SWE) received with UGC- Senior Research Fellowship from University of Agricultural Sciences, Raichur-584104, Karnataka in 2017. He has published more than 10 research articles in NAAS journals. Since from 2017 working as Assitant Professor in the Dept. of Soil and Water Conservation Engineering, College of Agricultural Engineering, University of Agricultural Sciences, Raichur, Karnataka, India.

Manu Khajuria
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Adaptability of *Lepidium latifolium L.* to temperature variations in the Ladakh Himalayas: A comprehensive study

The plants growing in high altitude Ladakh Himalayas experience significant temperature variations during their vegetative growth. In this study, the photosynthetic response of *Lepidium latifolium L.*, a sleeper weed, was investigated to short term temperature fluctuations. This plant maintained photosynthesis at higher temperatures by modulating the photochemical efficiency of photosystem II. Various physiological mechanisms including VpdL dependent and independent stomatal opening, the increase in the energy fluxes, closing of the reaction centers, and increase in the chlorophyll content play a crucial role in temperature tolerance. An efficient and dynamic non-photochemical quenching involving both zeaxanthin and PsbS dissipated the excess energy during higher temperatures. The degradation of the photosynthetic apparatus is compensated by increased expression of the subunit proteins. Other genetic elements that help in the repair and stabilization of the apparatus were also induced. Allyl isothiocyanate dependent modulation of the stomatal aperture acts as a swift response mechanism for the CO_2 exchange and evapotranspirational requirements. Collectively, these processes help mitigate the harmful effects of high temperature on the photosynthetic process. This data will help to strategize the spread of *Lepidium latifolium* in an ecologically sensitive Ladakh Himalayas during the climate change scenario.

Audience Take Away Notes

- The audience will be able to know about the adaptation of plants at high altitude environments
- If anyone wants to work on the medicinal and ecologically important plants at high altitude area, my presentation will help in understanding the possible mechanisms of survival at extreme environmental conditions
- This research could be used by other faculty to expand their own research or teaching
- This provides a practical solution to a problem that could simplify or make a designer's job more efficient
- It will improve the accuracy of a design, or provide new information to assist in a design problem

Biography

Manu Khajuria has earned her Ph.D. in Botany, specializing in plant adaptive biology. Since 2014, her research has been dedicated to understanding the adaptive potential of high-altitudinal plants in the Ladakh Himalayan region. Furthermore, her studies explore the correlation between photochemical efficiency and Δ9–tetrahydrocannabinol content in Cannabis sativa L., presenting a novel investigation within the realm of plant biology. Currently positioned as a Scientist in the Plant Sciences and Agrotechnology Division at CSIR-Indian Institute of Integrative Medicine in Jammu, India, she continues to advance scientific knowledge in the intricate field of plant adaptation. Her work serves as a valuable contribution to the broader scientific community, shedding light on the intricate interplay between environmental factors and plant physiology in challenging ecosystems.

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Solina: An grown organically ancient grain for the environment protection and the farm workers safety

In Italy, wheat breeding started in the early 1900s, had a significant impact on the productivity and quality of cereals in response to the demands of the processing industry and consumers. This selection process, however, caused a reduction in genetic variability and confined the cultivation of "ancient native varieties" to niche areas, entrusting their conservation to custodian farmers/cultivators and subsequently also to public research institutes.

Furthermore, in recent years, the need to follow a healthier diet has stimulated interest in organic products, grown with environmentally friendly agricultural practices and with the recovery of crop varieties, often ancient and native, which do not require irrigation, use of pesticides and synthetic fertilizers, according to EU strategies. In Italy the abundance of ancient varieties has allowed the recovery of several native varieties, in particular of wheat, recently rediscovered and cultivated.

One of these is Solina, an ancient common wheat grown in Abruzzo at least since the beginning of the 16th century. It is a variety of wheat still cultivated in the mountainous and marginal areas of the L'Aquila side of the Gran Sasso where, despite the harsh climatic conditions due to the high altitudes, interesting qualitative characteristics were obtained. The Solina production specification outlines the main characteristics of this cultivation, inspired by the dictates of organic cultivation, supporting the natural aptitudes for survival of this grain. The presence of these varieties is particularly marked in areas that have been able to conserve particular productive ecosystems thanks to the presence of natural parks, whose conservation policies have allowed the maintenance of ancient crops characterized by sustainable production practices.

The Solina, could play an important role since they can be grown in marginal environments and, being more resistant to stress and pathogens, they do not require pesticides and synthetic fertilizers compared to modern cultivar. This ancient grain therefore has all the characteristics to be used in sustainable agriculture to protect the environment and safeguard the safety of consumers and farm workers.

Audience Take Away Notes

This work aims to raise awareness among farmers and the scientific world on the choice to cultivate ancient varieties to:

- To protect the environment
- To improve farmers' health
- Cope with climate change; tackling climate change
- To protect farmers' economic investments

Biography

Dr. Di Luigi, graduate in Chemistry at the University of Rome “La Sapienza”, Italy, in 1994 and qualificate to practice the profession of chemist in 1994. Specialization in Safety and Industrial Protection obtained at the Graduate School of the University of Rome "La Sapienza", in1998. Researcher of the national institute for work insurance INAIL.

Marjana Zajc[1]*, Anja Koroša[1], Janko Urbanc[1], Andraž Krivic[2], Urša Pečan[3], Helena Grčman[3], Klemen Eler[3], Filip Vučajnk[3], Matjaž Glavan[3]

[1]Geological Survey of Slovenia, Ljubljana, Slovenia
[2]Igea d.o.o., Brezovica pri Ljubljani, Slovenia
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Analyzing agricultural land conditions with non-invasive GPR and thermal UAV surveys

One of the greatest burdens on the groundwater quality comes from diffuse pollution in agriculture. Precision agriculture reduces its impact on groundwater and ensures a more sustainable water and fertilizer usage. For correctly implementing precision agriculture procedures, knowledge of the geological settings, soil properties and dynamics of hydrogeological processes is required. Traditionally, the data on agricultural fields are gathered from individual points, e.g. from soil profiles, moisture probes, piezometers etc. However, these only provide information on pedological and groundwater characteristics in points, where the data is collected. Due to the vastly heterogenic hydrogeological and soil conditions in nature, this sometimes does not reflect the actual state of the surveyed area. As adding new points would mean additional costs as well as increased interference with the environment, we applied non-invasive methods to try and gather data on entire agricultural fields. We combined the traditional point methods with the quick and non-intrusive Ground-Penetrating Radar (GPR) measurements as well as thermal UAV imagery.

The GPR results provide information on the changes in the shallow subsurface, which allows us to identify areas of higher/lower signal attenuation, correlated with areas containing more/less water. This way we can spatially determine areas prone to water and nutrient retention as well as areas with faster water and nutrient runoff. In is also possible to track main soil horizons and the topsoil layer thickness throughout the entire field. The thermal UAV images also provide spatial information on changing field conditions, where higher soil temperatures correspond to drier parts of the field, while lower soil temperatures show areas with higher water content. Both GPR and UAV surveys are carried out on empty fields before crop growth to ensure the vegetation does not influence the imagery. Based on their results, the locations of soil profiling and installation of dielectric probes (for measurements of water content in soil) are determined. Together these point data, spatial GPR and UAV data provide information on the changing soil characteristics across the entire agricultural field, which can contribute to the optimization of precision agriculture procedures.

This research is funded by the Slovenian Research and Innovation Agency ARIS (research core funding No. P1-0011 and operation no. J1-4412).

Audience Take Away Notes

- The audience will learn about new, non-invasive, methods used in agricultural land surveys
- They will also learn about the importance of understanding geological conditions and their variation in the field
- This methodology could provide users with continuous spatial information on soil parameters in the field
- Determining areas of water retention and faster water runoff within a field can help reduce the use of water for irrigation and excessive use of fertilizers, which could pollute the groundwater
- Implementing these methods could improve precision agriculture practices

Biography

Marjana Zajc obtained her Ph.D. in 2015. Throughout her doctoral research, the emphasis of her work has been on the use of GPR in geology. During her postdoctoral research at The Life and Earth Institute at UCL, Belgium, she expanded her knowledge in the field of GPR to agronomic applications. In 2017, she started working at the Geological Survey of Slovenia, where she is using GPR to study the impact of agricultural activity on groundwater in an ongoing research project 'Use of the non-invasive GPR method and remote sensing for determining groundwater vulnerability due to anthropogenic impacts'.

Marouane Ben Massoud[1,2*], Oussama Kharbech[1], Abdelilah Chaoui[1], Astrid Wingler[2]

[1]University of Carthage, Faculty of Sciences of Bizerte, LR18ES38 Plant Toxicology and Environmental Microbiology, 7021, Bizerte, Tunisia

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Effect of exogenous treatment with Nitric Oxide (NO) on redox homeostasis in barley seedlings (*Hordeum vulgare L.*) under copper stress

The present research investigates the protective mechanism of Nitric Oxide (NO) in regulating tolerance to Cu-induced toxicity in shoots of barley (Hordeum vulgare L.). After 10 days, treatment with 200 µM CuCl2 caused a significant reduction in growth and photosynthetic efficiency concomitant with a strong increase in the contents of Reactive Oxygen Species (ROS), antioxidant enzymes activities such as Catalase (CAT), Superoxide Dismutase (SOD), guaiacol peroxidase (GPOX) and Glutathione Peroxidase (GPX). An increase in the lipid peroxidation markers malondialdehyde (MDA) and Lipoxygenase activity (LOX) indicated oxidative stress. Furthermore, inhibition of growth in 200 µM Cu-treated plants was associated with a reduction in carotenoids, chlorophyll and maximum photosystem II efficiency. However, copper treatment provoked a strong increase in activity of the glutathione-ascorbate cycle enzymes ascorbate peroxidase (APX), dehydroascorbate reductase (DHAR), Monodehydroascorbate Reductase (MDAR) and Glutathione Reductase (GR), but a decrease in levels of the non-enzymatic antioxidant compounds glutathione (GSH), Ascorbate (AsA). The addition of 500 µM of the Nitric Oxide (NO) donor, Sodium Nitroprusside (SNP), to the growth medium alleviated Cu toxicity by reducing Cu uptake and enhancing antioxidant capacity, as indicated by increased contents of GSH and AsA. The current results show that NO addition can alleviate Cu toxicity by affecting the antioxidant defense system, photosynthetic system and maintaining the glutathione-ascorbate cycle status, suggesting that NO treatment protects proteins against oxidation by regulating the cellular redox homeostasis.

Audience Take Away Notes

- The present investigation was performed in order to better understand the NO-induced modulation of Cu toxicity, with special focus on the involvement of the AsA-GSH cycle
- Test the role of Nitric Oxide (NO) in plant–heavy metal interactions
- In summary, we show that NO restores the cellular redox homeostasis, photosynthesis, and antioxidant defense systems by reducing Cu-induced toxicity in the shoots of barley seedlings

Biography

Dr. Marouane Ben Massoud studied Biology at the University of Carthage, Tunisia and the University College Cork, Ireland. He currently works at the School of Biological, Earth and Environmental Sciences, University College Cork. Marouane does research in Cell Biology, Plant Physiology, Molecular Biology and Proteomics. Their current project is 'Alleviation Of Heavy Metals Toxicity In Germinating Seeds By Exogenous Chemical Effectors'.

Dr. Mehtap Aydin*, Dr. Andrew John Harvey
Genetics and Bioengineering, Yeditepe University, Ataşehir, Istanbul, Türkiye

Analyses of (1, 3; 1, 4) glucan synthesis during barley coleoptile growth

The cell wall is one of the features that distinguish the structure of plant cells. It contains layers of polysaccharides that affect the development of the cell. (1, 3; 1, 4)-□-Glucan, otherwise known as mixed linkage □-glucan, is a non-cellulosic □-linked polysaccharide and is found primarily in grain cereals. The solubility of these high molecular weight glucan molecules in water is due to the introduction of □-1, 3-linkages into the long glucan chain, which causes kinks in the structure and reduces or even eliminates inter-chain hydrogen bonding. Mixed linkage □-glucan's solubility and gel formation are influenced by the uneven distribution of □-1, 3-linkages. Although the oligosaccharide pattern varies from a degree of polymerization of DP2-9, generally over 90% of the structure is comprised of blocks of 2 to 3 consecutive □-1, 4-linked glucosyl residues separated by single □-1, 3-linkages. It has been known for some time that cellulose synthase-like CslF enzymes are responsible for the formation of (1,3; 1,4)-□-Glucan, but the mechanisms for how the fine structure is arranged is as yet uncharacterized. In this study we attempted to further elucidate this process through a combination of transcriptomics and cell wall analyses.

Coleoptiles are an ideal tissue in which to study cell wall formation due to their lack of photosynthesis. In this study we extracted mRNA from barley coleoptiles from days 1 to 8 which encompasses the complete functional span of these structures. We performed Illumina NGS and analyzed the data, looking initially at the barley CslF genes. According to the analysis results, while HvCslF transcript level is high in the first four days of coleoptile development, their levels decreased from the 4th day until the 8th day. Especially on the 8th day, it dropped to the lowest levels. We will present data on expression timing and levels of the various HvCslF genes, and show important coexpressing genes. These results are then compared to analyses of the cell wall composition of barley coleoptile cell walls. Additionally, according to our NGS results, lichenase ((1, 3; 1, 4)-□-glucan hydrolase) was found to be highly negatively correlated, expressing at high levels towards the end of coleoptile development. This suggests that it breaks down and recycles b-glucan during the later days of coleoptile growth.

Audience Take Away Notes

- Overall, this study contributes to the broader understanding of plant cell wall biology and provides insights that could be leveraged for both fundamental research and practical applications in agriculture and biotechnology
- Other benefits
    - Cell Wall Composition Analysis, Analyzing changes in cell wall composition throughout coleoptile development provides a comprehensive view of the structural dynamics of the cell wall during growth. This information can be valuable for crop improvement efforts aimed at enhancing the nutritional value, digestibility, or mechanical properties of plant tissues
    - Identification of Coexpressing Genes, Identification of genes that are coexpressed with HvCslF genes provides valuable information about potential regulatory factors or enzymes

involved in (1, 3; 1, 4)-□-Glucan biosynthesis and metabolism. This can guide further research into the molecular mechanisms underlying cell wall composition and modification

- Understanding Cell Wall Formation, By focusing on coleoptiles, which lack photosynthesis and primarily serve in the structural support of young seedlings, the study provides valuable information on the dynamics of cell wall formation in a specialized tissue. This knowledge could have broader implications for understanding plant growth and development
- Functional Annotation of Lichenase, The finding of high expression levels of lichenase towards the end of coleoptile development suggests its role in breaking down and recycling (1, 3; 1, 4)-□-Glucan. This functional annotation enhances our understanding of enzyme activities involved in cell wall remodeling processes

Biography

Dr. Mehtap studied Biology at Fatih University, Istanbul. She received her Ph.D. degree in 2022 at Yeditepe University, Istanbul. She continues working there as a Postdoctoral researcher. She has studied abiotic stress, lncRNAs, miRNAs, and cell walls in plants.

Merve Seven[1], Andrew John Harvey[2]

[1]Department of Molecular Biology and Genetics, Bahçeşehir University, Istanbul, Türkiye

[2]Department of Genetics and Bioengineering, Yeditepe University, Istanbul, Türkiye

Pectins: Transcriptomic analysis of genes involved in their synthesis and modifications during barley seedling development

Plant cell walls are the strengthening constituent of plant cells and are composed of cellulose microfibrils cross-linked by hemicelluloses and embedded in a pectin matrix. Pectins, one of the groups of polysaccharides in the cell walls, are galactronic-acid rich heterogeneous polysaccharides with high degrees of complexity and substitutions. Among the functional richness, pectic polysaccharides are usually associated to the growth, defence, and control of cell wall porosity. Compared to dicots which have around 35% of pectin content in their cell walls, they are found at much lower abundance in commelinid monocots, around 2-10%. Pectins are assumed to be functionally replaced in monocots by other polysaccharides such as glucuronoarabinoxylans which also contain a large number of glucuronic acid monomers. Despite the minority of pectic polysaccharides in monocot cell walls, monocot genomes have large numbers of genes that are potentially involved in pectin biosynthesis and modifications, strengthening the importance of pectin during growth and development.

During germination of a barley seed, the coleoptile chaperons the true leaves to the surface of the soil. Coleoptiles are excellent platforms to examine cell growth and development since they are non-photosynthetic rapidly growing tissues, and their mRNA pools contain a larger percentage of genes involved in cell wall synthesis. Among numerous importance's of plant cell walls, their synthesis and modifications are closely linked to growth of plant cells, thus development of the plant tissues. As the coleoptile cells are rapidly growing, cell wall synthesis and modifications are tightly controlled at transcriptomic level. Thus, analysis of pectin associated genes during the barley coleoptile development hints the importance of role of pectins and how they are modified during early development. Understanding transcriptomic control contributes to knowledge of in muro metabolism and roles of transcripts for the seedling growth and adaptation. In this project we have completed transcriptomic analyses of coleoptile tissues from initiation to 3 days after termination of growth. The number, abundance, and coexpression analyses of genes involved in pectin biosynthesis in barley coleoptiles will be discussed.

Audience Take Away Notes

- The talk will enlighten the roles of putative pectin-related genes during barley seedling germination and development
- Understanding pectin synthesis and modifications during coleoptile growth will be useful for understanding cell wall biology during growth
- Plants are vulnerable to environmental stressors during germination, thus the knowledge about pectin metabolism can be used for understanding adaptation capacities of barley seedling to the stressors
- The findings can greatly contribute to the abiotic and biotic stress response mechanisms of plants

Biography

Dr. Merve Seven graduated from Department of Molecule Biology and Genetics, Istanbul University Türkiye in 2011. She pursued the Biotechnology Program at Yeditepe University and received her PhD degree in 2017. Then, she joined Prof. Markus Pauly's Institute of Plant Cell Biology and Biotechnology, Heinrich-Heine University, Germany for two years as a research fellow. After, she worked in Nobel Biotechnology Pharmaceuticals company. Since October 2021, she has been a faculty member at Bahçeşehir University Department of Molecular Biology and Genetics, and she is leading the Plant Biology research group. As a junior group leader, she has numerous publications in SCI(E) journals.

Moleboheng Lekota[1*], Motlatsi Morojele[1], Pulane Nkhabutlane[2]
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Characterization and pathogenicity of *Fusarium* species associated with soybean diseases

Soybean (Glycine max) is a major source of oil and proteins worldwide and the demand for soybean has increased in Africa, driven by the growing feed industry for poultry, aquaculture and home consumption in the form of processed milk, baked beans and for blending with maize and wheat flour. Hence the introduction and promotion of the crop in Lesotho, where the incidences of foliar, root rot and stem diseases have been observed constantly; threatening soybean production, causing large loss in yield and quality of the produce in soybean fields monitored. This study aimed at identifying the genetic, morphological and pathogenicity of the Fusarium Oxysporum (FOSC) and Fusarium Solani (FSSC) species causing Fusarium wilt and root rot, respectively. Forty soybean fields were surveyed at five locations during two consecutive seasons, and 20 isolates were recovered from symptomatic soybean plants. Identification of the fungus was based on colony morphological characteristics and phylogenetic analysis of nucleotide sequences of the Internal Transcribed Spacer (ITS) region of ribosomal DNA (rDNA) using ITS1-F and ITS4 primers. Twenty (20) isolates were identified as members of the FOSC or FSSC species. The pathogenicity of the isolates towards soybean seedlings was assessed in a greenhouse and showed that the two species of Fusarium were able to infect soybean. Considerable variability in pathogenicity was observed among the isolates with differences in the levels of pathogenicity recorded. In the FOSC and FSSC, 80% and 70% of the isolates were pathogenic, respectively. In this study, members of FOSC and FSSC exhibited considerable variability in morphological characteristics and virulence to soybean. To the best of our knowledge, this study is the first to provide information on the prevalence and variability of the pathogens associated with soybean wilt and root rot in Lesotho. This work contributes to the development of sustainable management strategies in soybean production.

Audience Take Away Notes

- Soybean diseases diagnosis methods, diseases symptoms and their management strategies
- The information obtained from the study can be used in breeding programs for development of disease tolerant soybean cultivars and other crops in general
- Timely soybean diseases management and design of proper management strategies
- This study will give the audience the insights of soybean production, diseases and it importance
- Improved soybean yields

Biography

Dr. Lekota has more than 15 years' experience in university teaching and agricultural research. Her research experiences and training has been diverse spanning general Agriculture, plant pathology, biotechnology, bioinformatics, metabolomics and plant microbial interaction. She obtained her Ph.D. at the University of Pretoria, South Africa in 2020. She has published nine scientific articles in ISI-rated journals and supervised several undergraduate and postgraduate student.

Mona Ali Albloushi[1*], Gary Foster[2], Andy Bailey[2]
[1]Ministry of Municipality, Doha, Qatar
[2]University of Bristol, Bristol, UK

Evaluation of salt tolerance genes expressed in transgenes *Nicotiana tabacum*

Salt stress is an abiotic stress that affects plant development in various ways, including fresh and dry weight, physiological characteristics, photosynthesis, chlorophyll content, Osmo protective solution buildup, and morphogenic stress levels. Salinity frequently inhibits plant development and agricultural yields. The impacts of salt stress can cause a significant decline in the condition of plant cells and adaptive mechanisms. All control plants showed great diversity in root development, physiological, and stem-root characteristics, and proline and chlorophyll levels. In this study, salt had a substantial effect on all variables evaluated.

Salt stress puts an osmotic and oxidative burden on plants, slowing photosynthetic and transpiration rates. Genetic modification is a promising technique for improving plant stress tolerance. Several isolated genes were employed to increase salt tolerance. N. tabacum was genetically modified with McHKT1 from Mesembryanthemum crystallinum and BADH from spinach to increase salt tolerance. 4 distinct recombinant constructs were successfully constructed to fuse putative salt tolerance genes under the 35S promoter with nptII to aid in selecting transgenic lines. In this investigation, the pCAMBIA2300 expression plasmid was used to insert the salt tolerance genes and construct the recombinant plasmids, *p*CAM:*Ca*M35S-*Ah*BADH-*t*NOS:*NPTII*, *p*CAM:*Ca*M35S-*McHKT1*-*t*NOs:*NPTII*, *p*CAM:*Ca*M35S-*Sp*BADH-*t*NOs:*NPTII*, and *p*CAM:*Ca*M35S-*Ss*NHX1-*t*NOs:*NPTII*.

Using RT-PCR, transgenic plants were found to express the *AhBADH*, *McHKT*1, and *SpBADH* transgenes in transgenic tobacco leaves.

The RT-PCR findings showed that these genes were expressed at comparable rates in N. tabacum lines growing at 25 and 35 °C. The RT-PCR results in this study revealed that *AhBADH*, *McHKT*1, and *SpBADH* were produced regardless of whether the plants were treated with salt because the 35S promoter regulates the genes. The 35S promoter from the plant pathogen Cauliflower Mosaic Virus (CaMV) has historically been used to drive constitutive expression of transgenes, expanding our understanding of the function of various plant genes as well as our general knowledge of plant processes. The CaMV 35S promoter is plant cells most thoroughly studied and experimentally validated regulatory component.

Transgenic plants carrying salt-tolerant transgenes behaved considerably differently under salt stress than untransformed tobacco. Notably, salt stress conditions had a considerable detrimental impact on untreated control plants' biomass, plant shoot properties, root development, and proline and chlorophyll levels. However, transgenic plants react differently to salt than wild-type plants. Furthermore, *AhBADH6* and *SpBADH5* outperformed the other lines regarding salt tolerance during the germination and seedling stages. As a result, these two lines may boost the development of salt-tolerant plants.

Audience Take Away Notes

- Audience will be able to use new technology to enhance crop production
- This research be used by other faculty to expand their research and practical teaching
- It also provides a practical solution to abiotic problem that effect crop production

Biography

Mona Albloushi is a biotechnology expert with more than ten years of experience working alongside the research team of Biotechnology department at Agricultural Research Department in Qatar. She received her PhD degree in 2022 at the University of Bristol in United Kingdom. Mona specialized in Molecular technology and is responsible for transferring new knowledge to the researcher staff, including isolation of genetic material, cloning and transformation. Mona is working on more than 4 projects deal with plat pathology and molecular identification. is Powerful force in the workplace and uses her positive attitude to encourage others to work hard and succeed.

Moumita Roy Chowdhury[1,2*], Chandran Nithin[1,3], Jit Mukherjee[4], Wolfgang Knogge[5], Susanne Kirsten[5], and Jolly Basak[5,6]

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[5]Department of Stress and Developmental Biology, Leibniz Institute of Plant Biochemistry, Halle/Saale, Germany

[6]Department of Biotechnology, Visva-Bharati university, Santiniketan, West Bengal, India

Genome-wide prediction of micrornas and long non-coding RNAs and their interaction in *Hordeum vulgare*

Barley (*Hordeum vulgare*) is an important cereal crop for its dietary value with rich source of proteins, lipids, carbohydrates, dietary fibres, flavonoids and unsaturated fatty acids. MicroRNAs (miRNAs) and long non-coding RNAs (lncRNAs) are two non-coding RNAs which play important role in post-transcriptional gene regulation (PTGR). Plant miRNAs are small ncRNAs which control various post-transcriptional and translational processes in the form of either repression or cleavage of the target. Long non-coding RNAs (lncRNAs) are responsible for up-regulation and down-regulation of transcription. In spite of the availability of the genome information of barley, very less study has been done so far on its non-coding genome. In this study, 870 miRNAs have been predicted by computational methods among which 451 are novel. These miRNAs belong to 137 different families. We have also identified 496 targets of 220 miRNAs along with their functional annotation. Besides, we have predicted 1567 lncRNAs, of which 67 are targeted by 45 novel miRNAs. We have also experimentally validated five randomly chosen miRNAs. Through this study, we have predicted new miRNAs and lncRNAs along with their targets to elucidate their roles in various biological pathways. Our analysis provides information about the non-coding genome of barley and their roles in PTGR, which may be used to improve the agricultural traits of this economically important crop.

Audience Take Away Notes

- It will explain the computational predictions of both miRNAs and lncRNAs along with experimental validation in this presentation. The audience can use the same prediction pipeline for the prediction of miRNAs and lncRNAs.
- There are only handful number of miRNAs present in miRBase. We only validated few miRNAs from the pool. Other faculties can experimentally validate the other miRNAs and find their function in the PTGR.
- The algorithm provided for the computational prediction of miRNAs and lncRNAs can be used by the other faculties and this will simplify their prediction methods.

Biography

Dr. Moumita studied Biotechnology at the West Bengal University of Technology, India and received her B. Tech degree in 2013. She got her M. Tech degree in 2015 from SASTRA University, India. She received her PhD degree from Indian Institute of Technology, Kharagpur, India in 2021. During her PhD she worked on plant non-coding RNA. She completed one-year postdoctoral fellowship supervised by Pr. Eric Masse at the Biochemistry department, University of Sherbrooke, Canada. She is currently working as an assistant professor in the Biotechnology department, Koneru Lakshmaiah Education Foundation, India. She published 8 journal articles in SCI(E) journals.

Musa Baldeh
Surex Farms, Gambia

Enhancing crop yield and sustainability through precision agriculture: A case study

This research document aims to address the challenges faced by modern agriculture, including resource inefficiency and environmental concerns, and proposes a solution utilizing precision agriculture techniques. The problem lies in the imprecise application of inputs, such as water, fertilizers, and pesticides, leading to wastage and potential harm to the ecosystem. The proposed solution involves the implementation of precision agriculture technologies, including remote sensing, Geographic Information Systems (GIS), and data analytics, to optimize input usage and improve crop yield. The methodology includes data collection through remote sensing, field sampling, and data analysis. The results indicate that precision agriculture techniques significantly improve resource efficiency, increase crop yield, and reduce environmental impact. The implications of this research highlight the potential for precision agriculture to address sustainability challenges and promote a more productive and environmentally friendly agricultural system.

Biography

Musa Baldeh is a visionary agribusiness specialist and entrepreneur with a relentless passion for sustainable agriculture and rural development. With a diverse background in both agriculture and business, he has become a voice in the agribusiness industry, spearheading innovative projects that aim to transform the way food is produced, processed, and distributed. His early exposure to the challenges and opportunities of the food market instilled in him a deep appreciation for the sector significance. He earned his bachelor's degree in Management and Development studies from the University of The Gambia, where he became keenly aware of the critical need for efficient and responsible practices. However, driven by a desire to make a tangible impact, Musa decided to combine his expertise in agriculture with his entrepreneurial spirit and established his own agribusiness startup. His company, " Surex Farms, & quot; is a pioneering venture focused on creating sustainable and regenerative agricultural models. Through Surex farms, Musa aims to promote environmentally friendly farming techniques, optimize resource utilization, and foster equitable partnerships with local farmers. He firmly believes that agribusiness can be a force for positive change, providing food security and economic growth while safeguarding the planet's natural resources. Musa's speaking engagements revolve around sharing his insights on sustainable agriculture, the future of agribusiness, and the role of technology in transforming the sector. He passionately advocates for collaboration between the public and private sectors, emphasizing the importance of knowledge-sharing and investment in agricultural research and development. As a sought-after speaker, Musa is delighted to be presenting at the esteemed International Agribusiness Conference. He plans to discuss the potential of sustainable practices to address global food security challenges, showcase real-life success stories from Surex farms, and engage with fellow industry experts to explore new opportunities for creating a more resilient and inclusive agricultural future. Beyond his professional achievements, Musa enjoys spending time with his family and remains closely connected to his farming roots. In his leisure time, he can often be found tending to his own farm and experimenting Musa's dedication to agribusiness, coupled with his visionary ideas, makes him a compelling presenter whose insights promise to inspire and spark transformative discussions at the International Agribusiness Conference.

Navdeep Singh[1*], Clarissa Getigan[1], Juan Marcelo Gómez[3]
[1]Seneca Applied Research, Seneca Polytechnic, Toronto, Ontario, Canada
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Advancing sustainable agriculture: The role of variable rate technology in emission reduction and resource optimization for small-scale farmers

This study investigates the potential of Variable Rate Technology (VRT) to promote sustainable agricultural practices in response to urgent environmental challenges. The objective of the research is to quantify emission reductions by concentrating on the efficacy of VRT in optimizing resource utilization and reducing carbon footprints. Our research evaluates the influence of VRT on small-scale cultivation, with a focus on prevalent, high-yield crops.

To assess performance, we implement a comparative case study that contrasts variable rate technology with conventional practices. Our objective is to quantify Greenhouse Gas (GHG) emissions and economic outcomes throughout the agricultural lifecycle. This study suggests that VRT is effective in reducing environmental impact and enhancing profitability by capturing spatial variability and assessing key environmental and economic indicators using remote sensing and GIS technologies.

This applied research endeavours to influence agricultural practices by informing policies that support small-scale producers in the adoption of VRT, thereby improving their sustainability and resilience in the face of environmental challenges. The relevance and applicability of our findings facilitate knowledge exchange and capacity building within the agricultural community, extending to policymakers and business decision-makers, as a collaborative approach.

The study underscores the significance of VRT in fostering sustainable agriculture and fuelling impact investment through technological innovation. This research has the potential to establish sustainable and resilient agricultural systems by bridging the divide between economic prosperity and environmental conservation. Our results offer compelling evidence of the potential of VRT to improve agricultural sustainability and mitigate climate change. This research endeavours to contribute to a more sustainable future for the agricultural sector by providing producers with data-driven insights to optimize resource use and reduce their carbon footprint.

Audience Take Away Notes

- **Optimization of Resource Usage through Variable Rate Technology (VRT):** Audience members will understand how VRT can significantly reduce resource consumption and emissions compared to conventional farming methods
- **Economic Benefits for Small-Scale Farmers:** Insights into the profitability and cost-effectiveness of VRT, highlighting how it can improve yields and reduce input costs
- **Policy Recommendations for Sustainable Agriculture:** Discussion on how the research findings can inform policies that support the adoption of VRT, promoting sustainability and resilience in agriculture

Biography

Navdeep Singh is an agricultural professional adept in sustainable business and environmental project management. With expertise in organic farming, soil analysis, carbon accounting, waste auditing, mushroom, and hydroponic cultivation, his leadership and dedication drive impactful initiatives. His commitment to excellence and community engagement propels sustainable agriculture and environmental management advancements.

Noemi Stadler Kaulich
Mollesnejta-Institute for Andean Agroforestry, Combuyo, Cochabamba, Bolivia

Agroforestry-land utilization method for food security and protection of natural resources

Climate change, loss of soil fertility and declining biodiversity are jeopardizing humanity's food supply. Agroforestry can ensure food security through the following points:

Adaptation to climate change:

- Tree crowns dampen the wind (prevent wind erosion)
- provide shade or partial shade depending on the tree species and pruning
- the foliage covers the soil and prevents silting by raindrops
- the roots stabilise the soil (prevent water erosion and landslides)

Improves soil fertility

- The tree absorbs nutrients via deep roots, forming branches and leaves, the leaves fall to the ground and enrich the topsoil with "new" nutrients
- Trees release up to 1/3 of their assimilates from photosynthesis into the soil via their roots to feed the soil biome
- Dead roots are biomass in the soil and therefore food for the soil biome
- Biomass from leaves, fallen branches, dead roots and the assimilates become permanent humus, a long-term C sink

Increase in yields

- Agroforestry enables an increase in yields through three-dimensional land utilisation
- Permanent humus in the soil means an active soil biome that synthesises new nutrients and stores them in the humus, as well as moisture, so that high-yield harvests can be expected.
- Biodiversity
- Balance between pests and beneficial insects - pesticides become unnecessary
- Habitat for wild animals, insects (above ground)
- Beneficial bacteria, fungi, woodlice (underground)

Increase in income

- Diversification of production
- Higher quality of production
- Better health for humans and animals (no need to use chemical agricultural additives)

- A fully nourished crop contains the full complex of nutrients and secondary plant substances that are necessary for the healthy nutrition of humans and animals and therefore promote their health.

For all this points the presentation will show examples in the field.

Audience Take Away Notes

- The audience will know about the impacts of agroforestry and can decide about to implement or not
- The audience will have the most actual information about Agroforestry and the latest research data

Biography

Dr. Noemi Stadler Kaulich studied Chemistry at the Sofia University, Bulgaria and graduated as MS in 1999. She then joined the research group of Prof. James at the Institute of General and Inorganic Chemistry, Bulgarian Academy of Sciences (IGIC-BAS). She received her PhD degree in 2004 at the same institution. After one year postdoctoral fellowship supervised by Dr. Williams at the Catalysis and Spectrochemistry Laboratory, France she obtained the position of an Associate Professor at the IGIC. She has published more than 70 research articles in SCI(E) journals.

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Evaluation of the response of some common cultivars and promising lines of rice to salinity stress

Salinity is one of the limiting factors for rice cultivation all over the world. In the conditions of salinity stress, ion poisoning (due to the presence of ions such as sodium and chlorine), osmotic stress and malnutrition limit the growth of the plant and disrupt the metabolic balance of the cell and create oxidative stress. Rice with 3dS/m tolerance threshold is one of the most sensitive plants to salinity. This plant is relatively tolerant to salinity in the stages of germination, tillering and maturity, but it is sensitive to salinity in the seedling and reproductive stages. Evaluation, screening and identification of rice genotypes tolerant to salinity stress in order to introduce and use in saline soils and using them in breeding programs are important. It is obvious that the production and use of stress-tolerant cultivars can reduce yield loss in current saline lands.

In order to evaluate tolerance to salinity, 18 new genotypes of rice, including new improved cultivars and advanced breeding lines, along with international genotypes tolerant to salinity in the vegetative and reproductive periods (478 FL, 266-TCCP and sensitive 29 IR) and Hashemi and Tarem local cultivars were screened at seedling stage. In order to screen them, the seeds of the studied genotypes were placed in hydroponic culture conditions after germination and the two-week-old seedlings were exposed to 50 and 100 mM NaCl salinity (monitored every week). Evaluation after 8 days of morphological and physiological traits showed that Kian, Tolo and Anam genotypes showed more tolerance to 100 mM stress than the tolerant control genotypes. Among the data measured in this research, only important traits such as the dry weight of roots and shoots and the ratio of sodium to potassium in leaves and roots are given in this report. The highest dry weight of shoot was measured in TCCp, Kian, and the lowest in Barkat and AR1. In addition, the highest root weight was reported in Kian, Tolo and Anam and the lowest in Khazar and Tarem. In normal conditions, there is no significant difference between stress and control, but in stress conditions of 100 mM, the ratio of sodium to potassium in some genotypes such as Tarem, Hashemi and Khazar is even higher than the sensitive variety IR29. In Keshvari, Kohsar, Tolo, Gilane and Anam cultivars, this ratio reaches its minimum value in aerial parts.

Audience Take Away Notes

- We hypothesized that this data could use as effective screening methods aimed at pinpointing tolerant genotypes
- These methods could significantly enhance crop establishment and early plant growth, particularly in salt stress situation
- Further investigation of this research could be pursued by students specializing in agricultural, physiology especially environmental stress studies

Biography

Parisa, a plant physiology specialist, graduated from Tarbyat Modares University. At the same time, as a research assistant professor in the department of molecular physiology of ABRII continued her research on tolerance to abiotic stresses on crop plants. He has published several articles on the tolerance mechanism of wheat and rice to salinity and drought stress. Currently, she is the head of the department of molecular physiology and the manager of the strategic program of climate-adapted plants and cooperates with the rice and breeding and seed research centers.

Patrícia Bourguignon Soares[1*], Natã Carlos Lira Madeira[1], Mariela Mattos da Silva, Sabrina Garcia Broetto, Diolina Moura Silva[1], Geraldo Rossoni Sisquini[2], Eustáquio Vinícios Ribeiro de Castro[3]

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[3]Chemistry department, Exact Science Center Federal University of Espirito Santo, Vitoria, ES, Brazil

Management tools for identifying cause-and-effect indicators determining the vitality of restinga vegetation affected by mining tailings mud for decision-making on preservation actions and environmental risk mitigation

Management tools can be defined as instruments, methods, software, or approaches used by organizations to optimize and enhance various processes, assisting in making informed decisions directly associated with improving their operational efficiency. The aim of this study was to apply the use of a management tool, Key Performance Indicators (KPIs), to identify the effects of metals such as Fe, Al, Mn, Ba, Cr, Cu, Ni, Pb, V, Zn on plant species in the restinga ecosystem affected by mining tailings mud, which occurred in 2015 in the city of Mariana/MG and impacted the coastal region of Espírito Santo, where the ecosystem is located. Firstly, raw data were obtained from in situ analyses to monitor the effects of metals present in the tailings mud. The data were collected from individuals, populations, and communities of representative species from herbaceous, shrubby, and arboreal formations, during the dry and rainy periods from 2019 to 2021. Soil analyses were previously performed by ICP-MS. Biological analyses included: i) seed bank identification based on specific literature from the areas; ii) seed germination, determined by seed bank evaluation, considering that seeds from natural banks are in a dormant stage, the acid scarification method with sulfuric acid was used; iii) transient chlorophyll fluorescence; iv) net photosynthesis and gas exchange; v) photosynthetic pigments with pigment levels determined in extracts; vi) oxidative stress, with analysis of antioxidant system enzymes. Based on the raw data generated from collections and analyses, statistical analyses were performed: PCA (Principal Component Analysis), Analysis of Variance (ANOVA), mean test, and linear correlations to evaluate the effects of metals on the analyzed plant species. Through these analyses, four categories of biological response were identified: primary productivity (net photosynthesis and photosynthetic performance index), oxidative stress (SOD and MDA enzyme activity), primary metabolism (ascorbate and proline measures), and reproduction (flowering and fruiting). Using the four categories of biological response obtained, KPI calculations were made, resulting in the main indicator being plant vitality, providing alerts for risk and danger situations of the analyzed species, with reports presented through dashboards. Therefore, the application of management tools, in this case, KPIs, allowed the monitoring of threatened plant species in the presence of metals, with optimized analyses and organized data for presentation to governmental authorities. This study can be expanded to different ecosystems and situations, from environmental disasters to monitoring crop diseases and pests.

Audience Take Away Notes

- Management tools can be applied to monitor different ecosystems, addressing various impacts such as pest presence, floods, and different environmental disasters
- The gathering of cause-and-effect indicators assists in the decision-making process and process optimization, avoiding excessive resource expenditures

- The presentation layer, through dashboards, allows for the presentation of complex data in a didactic manner, enabling individuals from different areas of knowledge to understand the results obtained

Biography

Patrícia Bourguignon Soares holds a Master's in Civil Engineering from UFES, with the title "Science, Technology & Innovation Indicators: Analysis of the Scientific and Technological Production of the Knowledge Area in Civil Engineering in the Web of Science",completed in 2014. She also completed a Postgraduate degree in Oil and Gas Management from FAESA and a degree in Business Administration from Faculdade Estacio de Sá de Vitoria (2004). Currently,She is a PhD student in Biotechnology program of UFES and acts as Project Manager at Fundação Espírito Santense de Tecnologia-FEST, She manages Research and Development projects developed within the scope of the Federal University of Espírito Santo.

Paul Luzuriaga[1*] PhD(c), Carlos Luzuriaga[2]
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Arid soils regeneration through sustainable reforestation

Arid lands could cover between 16 and 30% of the land surface and are home for about 20% of the Earth's population. They are predominantly found in the subtropics and set to grow every year in part due to climate change conditions.

Deforestation, land over exploitation, pesticides overuse, oil & mining industries, are among the main driving factors for desertification and soil degradation. As those areas become difficult or expensive to sustain any crop production, people will move to new territories, and the vicious circle starts all over again.

This comprehensive restoration solution reverses that vicious circle, focusing on the soil reconditioning through reforestation combined with associated crops that will deliver some income to working communities until the wood is harvested in a very specific sustainable way after 25 to 50 years and commercialized as sustainable certified wood, while also collecting the carbon credits associated to the forest management.

This reforestation and soil restoration program started in 2003 as an applied research program to prevent desertification in already degraded soils in Ecuador. After 20 years of learnings, the program was scaled up to present a sustainable commercial reforestation solution for arid, polluted, saline, or degraded lands. Some forestry management protocols for propagation, planting, watering, management, wood harvest and byproduct production were developed, and several economic analyses were performed for different planting, growing and exploitation schemes tested.

The work was done with endemic species or already adapted species that contributes to soil restoration and/or water retention, and the whole process is closely monitored with telemetry and remote sensing solutions. Precision agriculture applied to forestry management and land restoration has been key for our success when working in such stressful conditions. This solution was developed to address the triple bottom line model: financial return, environmental sustainability, and social benefits.

Species analyzed included Neem tree (Azadirachta indica), Mesquite (Prosopis pallida), and Blue eucalyptus (Eucalyptus bicostata) combined with different grass and legume rotations.

Audience Take Away Notes

- Results summary from two experiences regenerating arid soils in dry coastal areas
- Lessons learned from different species and planting conditions when regenerating depleted soils in areas without rain nor irrigation
- Socio-economic outcomes from soil regeneration with forestry initiatives in poor communities

Biography

Paul Luzuriaga is a PhD candidate in Environmental Engineering with the University of Calgary, and Doctor Candidate in Business Administration with Florida International University, with about 20 years of experience in forestry research, soil regeneration, byproduct utilization from forests, environmental financial modeling, and impact investing.

Witaya Pimda[1], Aphinya Thinthasit[2], David Nugroho[2], Rachadaporn Benchawattananon[2*]

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Effect of moisture level on growth of rice (*Oryza sativa* L.) under green hydrogel (*Cladophora glomerata* and *Spirogyra sp.*)

A method has been devised to use polymer hydrogels to retain moisture in soil and support plant growth under challenging environmental circumstances. Polymer hydrogels are used to moisturize soil. The polymer chains in these hydrogels are hydrophilic, meaning they have an affinity for water, and may retain water inside their structure. Polymer hydrogels have been widely utilized to enhance the water accessibility of plants by augmenting the water retention capacity of soils and substrates. The implementation of hydrogel polymers could be a suitable method to enhance the effectiveness of water and fertilizer utilization. The study effectively prepared a nanocomposite hydrogel with a consistent cross-linked structure, supplied from multiple materials, for the purpose of retaining soil moisture as polymer hydrogels. The hydrogel that was synthesized underwent characterization using Fourier-Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscope (SEM), and X-ray Diffraction (XRD). The nano hydrogel, made from Cladophora glomerata and Spirogyra sp. is a potent ion for promoting plant development. It undergoes full swelling within around 14 days. Furthermore, the analysis of different levels of Soil Moisture (50, 70, 80%) in conjunction with varying concentrations of nano Hydrogel (0, 0.3, and 0.6%) reveals that the combination of 80% moisture and 0.6% hydrogel concentration provides the optimal conditions for the growth of Oryza sativa L. plants. These characteristics indicate that the nano hydrogel has the potential to function as a Superabsorbent Polymer (SAP) in soil.

Audience Take Away Notes

- Very important for adapting to global warming causing changes in drought conditions
- Can produce hydrogel Can stop the death of rice
- Teaching students and transfer knowledge to farmers
- Easy for use green hydrogel for stop the death of plants
- Develop new formats using modern scientific knowledge Helps to access, use easily, safely and save the world
- Help drought conditions
- Green hydrogel safely and save the world

Biography

Dr. Rachadaporn Benchawattananon studied at Bachelor and master degree from Khonkaen University and finished Ph.D. in Environmental Biology in 2001. Now lecturer and researcher more than 24 years at Forensic Science, Integtrated Science Faculty of Science Khon Kaen University, KhonKaen Thailand. The publications more than 25 and 3 keynote speaker on international conference.

Rahul Chillawar
Yeshwant Mahavidyalaya Nanded Department of Botany

Identification phytochemical investigation and ethanobotanical study of Vitex negundo L

This comprehensive project delves into the multifaceted exploration of Vitex negundo L., a medicinal plant native to India. The seventh-largest country globally, India boasts a diverse landscape with an abundance of plant life. Vitex negundo L. stands out as a medicinal powerhouse, often referred to as the 'Botanical Garden of Asia' due to its rich biodiversity. With approximately 45,000 plant species, India ranks fourth in plant diversity among Asian countries.The research focuses on the morphological, phytochemical, and ethanobotanical aspects of Vitex negundo L., specifically studying its stem parts and leaves. Phytochemical analysis reveals a myriad of compounds, including flavonoids, glycosides, terpenoids, steroids, tannins, alkaloids, and more. These components, distributed throughout various parts of the plant, hold immense pharmaceutical potential, acting as protective mechanisms for the plant itself. The ethanobotanical study uncovers the traditional uses of Vitex negundo L., known locally as Nirgundi, which translates to 'protection against diseases' in Sanskrit. It has been employed in Ayurvedic medicine for centuries to address ailments like fever, cough, rheumatism, and arthritis. Moreover, recent research suggests its efficacy in modern diseases, such as diabetes, cancer, and neurodegenerative disorders.

The project also emphasizes the pressing need for the survey of medicinal plants and their components due to the escalating challenges posed by communicable and non-communicable diseases, exemplified by the recent COVID-19 pandemic. Lack of knowledge about medicinal plants leads to preventable deaths, underscoring the importance of disseminating this information for public health.

In conclusion, the morphological, phytochemical, and ethanobotanical study of Vitex negundo L. contributes valuable insights into its medicinal properties. The plethora of identified phytochemical constituents and traditional uses have been scientifically validated, establishing its potential as a source for new drugs. However, further research is imperative to fully comprehend its therapeutic capabilities and develop safe and effective drugs from its rich phytochemical components.

Audience Take Away Notes

- The audience benefits from a wealth of knowledge that spans traditional medicine, pharmaceuticals, public health, and future research possibilities, offering a holistic perspective on the significance of Vitex negundo L. in the realm of medicinal plants
- Professionals across different domains, including pharmaceuticals, biology, traditional medicine, public health, education, and policymaking, can find practical applications and insights from this project, enriching their respective areas of expertise
- The multifaceted exploration of Vitex negundo L. opens avenues for collaboration and expansion in various academic disciplines. Its contributions to pharmacology, botany, ethnobotany, public health, and potential for interdisciplinary applications make it a valuable resource for faculty looking to advance their research or enhance their teaching materials

- The direct impact on design accuracy may be limited, the multidisciplinary nature of the project opens avenues for cross-disciplinary applications. It could serve as a valuable resource for researchers and professionals looking to incorporate natural elements and traditional knowledge into their respective fields, potentially leading to more informed and holistic design solutions
- The project provides a deep understanding of the morphological, phytochemical, and ethanobotanical aspects of Vitex negundo L
- Individuals working in public health can appreciate the emphasis on the survey of medicinal plants, recognizing the potential impact on preventing diseases
- Scholars in public health may find the emphasis on the survey of medicinal plants relevant. The project highlights the importance of understanding such plants for disease prevention, aligning with broader public health initiatives

Biography

Mr. Rahul Chillawar studied Botany at the Yeshwant Mahavidyalaya Nanded SRTMUN University Nanded, India and Post graduated in 2023. He has published 02 Research papers.

Raphael Linker[1*], A. Dagan[1,2], E. Raveh[3], S. Baram[4], T. Paz-Kagan[2]

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`Estimation of canopy nitrogen content in citrus orchards using UAV and satellite multi-spectral imagery

Precise Nitrogen (N) monitoring, considering spatiotemporal variations, is essential for optimal fertilization in orchards. Traditionally, N assessment relies on labour-intensive leaf chemical analysis. Our study integrates multi-spectral Unmanned Aerial Vehicles (UAVs) and satellite data to estimate Canopy N Concentration (CNC) in citrus orchards, the ultimate goal being to improve Nitrogen Use Efficiency (NUE) and reduce environmental pollution. The study was conducted in commercial citrus plots in Hefer-Valley, Israel, and included two phases. The first phase, from May 2019 to April 2022, involved four plots planted with a single citrus variety (Newhall oranges). In the second phase, 12 plots with five different citrus varieties (Or, Ora and Michal mandarins, Valencia oranges, and Marsh grapefruit) were added to the study. The study included six main steps: (1) collection of leaf samples for laboratory N content analysis, (2) acquisition and preprocessing of multispectral images acquired with a UAV equipped with a multi-spectral camera, (3) segmentation of individual trees and extraction of relevant features, (4) development of a random forest model for estimating CNC using UAV multispectral imagery, (5) collection of spectral data from Sentinel-2 satellites, and (6) creation of a fused multispectral UAV & Sentinel-2 model for estimating CNC. As part of this process, robust methods were formulated to accurately delineate individual trees and extract pertinent information at the tree scale. This segmentation process facilitated the extraction of features that were used in the CNC models. Additionally, by incorporating photogrammetry data, it was possible to estimate tree biomass, a critical step in upscaling N content from the leaf to the canopy level. The Random Forest (RF) model for CNC of Newhall cultivars, based on UAV Vegetation Index (VI), Sentinel-2 data, and structural data from SfM-photogrammetry, achieved a R2 of 0.80 and a Root Mean Square Error (RMSE) corresponding to 7.5% error. The multispecies model developed with UAV-derived VIs, Sentinel-derived VIs, and structural features, yielded a R2 of 0.77 and a RMSE corresponding to 11% error. Feature importance analysis highlighted that in both Newhall and multispecies models, UAV VIs were the most influential, followed by canopy height, while Sentinel-2 VIs played a relatively less significant role. Canopy-scale heatmaps of nitrogen content were generated to provide insights into its spatial distribution and temporal patterns, which could support the development of Site-Specific N Management (SSNM) guidelines.

Audience Take Away Notes

- Multi-spectral robust estimation of canopy nitrogen content in citrus orchards by multispecies model

- Potential of remote sensing for orchards nitrogen management
- Potential of combining multi-spectral imagery from UAVs and satellites

Biography

Raphael Linker is Professor at the Faculty of Civil and Environmental Engineering at the Technion-Israel Institute of Technology. He received a degree in electro-mechanical engineering from Brussels University (Belgium) and MSc and PhD degrees from the Faculty of Agricultural Engineering at the Technion. His main research interests are related to the use of advanced approaches for sensing, control and optimization of agricultural and environmental systems. He has supervised over 40 graduate students and has co-authored over 90 peer-reviewed publications.

Richard Dick
School of Environment and Natural Resources, Ohio State University, Columbus Ohio, USA,

Optimized Shrub-Intercropping System: A Novel Rhizosphere Alliance to Increase Crop Production and Mitigate Drought in the Sahel

He Sahel is facing severe soil degradation and chronic food insecurity. An overlooked solution are the shrubs, *Guiera senegalensis* or *Piliostigma reticulatum*. Although these are found in farmers' fields throughout the Sahel; shrub density is low and the current management of coppicing and residue burning prior to cropping deprives soils of much needed organic matter. In contrast, our team over 20 years has shown that non-thermal management is feasible, and ecologically and agronomically very beneficial. Research in farmers' fields and two long-term factorial experiments (each intercropped with *G. senegalensis* or *P. reticulatum*) of an optimized shrub-intercropping system (OSS) (~1500 shrubs ha^{-1} with coppiced residue returned to soils) compared to sole-cropping (under varying NPK rates of 0 to 1.5 times the recommended rate) relative to edaphic and agronomic performance of the staple crops pearl millet and groundnut in Senegal. After 10 years, *OSS showed great potential to sequester* C with 3700 more kg ha^{-1} of total C than the ¯shrub plots (6667 compared to 2952 kg ha^{-1} total C) with *G. senegalensis*. *G. Senegalensis* on the more sandy soil and drier northern site had more dramatic effects on C properties. Overall, OSS is increasing soil quality and harbors a more diverse/beneficial microbiome for crop production. Significantly, both shrubs perform hydraulic lift (HL) (movement of water via deep roots from wet sub- to dry surface-soil at night) with the profound discovery with *G. senegalensis* that it transferred isotopically labeled HLed water to adjacent millet plants - *meaning shrubs are "bioirrigating" crops*. Shrubs reduce time to harvest by ~15 days further buffering against low rainfall. *Notably both millet and peanut yields have been dramatically increased with* OSS. OSS is advantageous for subsistence Sahelian farmers, because it is a *local*, *familiar resource* that does not require any new infrastructure nor even external inputs – thus overcoming Green Revolution technologies shortcomings. Twenty years research has shown that OSS regenerates degraded soils, increases crop productivity, resists drought, and sequesters C; all of which is critical to address a changing climate – thus providing a sound scientific basis for piloting, demonstrating and ultimately scaling OSS across the Sahel to increase food security and regenerate degraded landscapes.

Audience Take Away Notes

Applicable to West Africa:

- The Optimized Shrub-intercropping System (OSS) remediates degraded soils
- OSS harbors beneficial microorganisms known to promote plant growth
- Two native shrubs bioirrigate adjacent crops, reducing drought stress
- OSS dramatically increase crop yields
- OSS is an appropriate biotechnology for subsistence farmer that is expected to reduce food insecurity

Biography

Richard Dick is an Ohio Eminent Scholar and Endowed Professor of Soil Microbial Ecology at Ohio State University. His research focuses on microbial communities in controlling biogeochemical processes and delivering ecosystem services for agricultural and environmental applications. The research program discovered enzyme assays that are sensitive soil quality indicators. Dr. Dick has authored 158+ journal articles, 17 invited book chapters, and 2 books as the editor-in-chief. He was elected as President and held other positions for the Soil Science Society of America (SSSA) and served as editor for several journal. He worked as an agronomist for 3 years in Bangladesh, and has lead research and development projects for >20 years in West Africa.

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Influence of geology on physico-chemical parameters and fertility of ferralitic soils: Case of Gabonese sedimentary coastal and Granito-Gneissic basin

The second Sustainable Development Goal (SDG2) aims to eradicate hunger through the implementation of sustainable and resilient agricultural practices. This objective can't be achieved without taking account soil. This is why the study of soil through their physico-chemical characterization and the evaluation of their fertility has become a global issue in general and the Congo Basin in particular. In Gabon, there are different geological substrate on which mainly ferralitic soils have developed. However, soils' physico-chemical data are very old and studies on their fertility status are very rarely. The physical and chemical characteristics of the soils of coastal basin and granite-gneissic substratum of Gabon were evaluated to assess the fertility and productivity status of the soils. Sampling was carried out on the SOGADA sites in Kango (coastal basin) and Koulamoutou granito-gneissic basin. The results obtained showed that the lithology of the two sites leads to soil quality that is different from each other. Indeed, the texture of the topsoil in the Kango site is loamy while that at Koulamoutou is laomy-sandy-clayeyed. Furthermore, the soil pH is very acidic to extremely acidic in coastal basin and granite-gneissic substratum respectively. This difference in acidity, closely linked to lithology, limits the bioavailability of nutrients (available phosphorus and exchangeable bases). Organic matter (12.45±5.00%; 13.82±7.42%) and available phosphorus are lower in coastal basin (1.95±3.16ppm) compared to granite-gneissic (4.69±6.03ppm). Nitrogen contents followed a similar trend to that of OM, higher in koulamoutou (0.68±0.35%) than in Kango (0.62±0.25%). Conversely, the cation exchange capacity (6.14±1.56 cmol.kg-1; 2.45±0.60cmol.kg-1) and the sum of exchangeable bases (SB, (Ca^{2+}, Mg^{2+}, K^{+} and Na^{+}) are higher in coastal basin (17.03±4.86 cmol.kg-1) than in granito-gneissic basin (5,08±1,22 cmol.kg-1). Our results also showed that nutrient reserve (CEC/clay) is greather in kango (79.22%0 than in koulamoutou (16.33%) which can be explained by the type of clay minerals. However, in view of the so-called high saturation rate of the two soils (>60%), it appears that the exchangeable bases (Ca^{2+}, Mg^{2+}, K^{+} and Na^{+}) are less subject to desaturation but rather to mineralogical activity of the type of clays that the sites contain. In addition, the evaluation of the fertility status of the Koulamoutou and Kango sites showed that the pH, available P and CEC are the factors limiting the fertility of Gabonese ferralitic soils' fertility. However, although both sites are class IV soil fertility and therefore present severe limitations. The Kango site is distinguished by a fertility described as average, unlike the Koulamoutou site where it is said to be low.

Audience Take Away Notes

- Have a recent data on the physico-chemical parameters of ferralitic soils.
- Assessment of soil fertility
- Better understand the geological's influence on soil fertility
- This research could be used by other faculty to expand their own research or teaching
- This provides a practical solution to a problem that could simplify or make a designer's job more efficient
- It will improve the accuracy of a design, or provide new information to assist in a design problem
- Other benefits.
    - Prove sustainable agriculture

Biography

Dr. Rolf Gael Mabicka Obame studied soil science and environment at university of Poitiers, Orleans and Rouen Universities, France and graduated as MS in 2007. He then joined the research group of Michel Mbina Moumgoungui at the Department of Geosciences and environment, University of Science and Technology of Masuku of Gabon. He received his PhD degree in 2019 at the same institution. He works on soil organic carbon sequestration in and soil fertility. Since 2016 he Associate professor at National Institute of Agronomy and Biotechnology Franceville, Gabon and has published more than 14 research articles in SCI(E) journals.). He is actually member of the Steering Committee of the Global Network of Soil Analysis Laboratories (GLOSOLAN) and ambassador of the African Community of Practices at World Soil Information (International Soil reference and Information Centre, ISRIC.

Rubén D. Collantes G.
Instituto de Innovación Agropecuaria de Panamá, Estación Experimental de Cerro Punta, Chiriquí, Panama

Alternative and sustainable use of agroecosystems in Panama

The constant changes in agroecosystems have led to the reduction of land dedicated to agricultural production to the benefit of urbanization and industrialization. This pressure is transferred to wildlife areas, in which human activity in agriculture has increased; conventional management persists and leads to negative impacts on human health and the environment, putting Food and Nutritional Security (FNS) at risk and compromising the availability of natural resources. This essay illustrates part of the work carried out in Research, Innovation and Development (R&I&D) in Panama, in some strategic areas for FNS and reflects on the alternative and sustainable use that can be enhanced through productive diversification, the use of local talent for the development of goods with added artistic and cultural value, synergistic integration with society in activities such as beekeeping, agroecological and sustainable agroforestry production systems, to name a few examples. This, in response to characterization and sustainability studies developed in sectors relevant to Panamanian agriculture. Likewise, there are some pending challenges to overcome.

Audience Take Away Notes

- This work will enlighten the audience about some sustainable alternatives for the appropriate use of productive agroecosystems
- It is a compendium of some research on the subject developed in Panama during the last five years, which can be replicated in other countries in the Latin American and Caribbean region, mainly
- The importance of transdisciplinary collaboration is highlighted, through which it has been possible to research, develop and innovate (R+D+I) on the subject

Biography
Rubén Collantes is an Agronomist, with a M.Sc. in Entomology, a M.Ed. and a Ph.D. in Sustainable Agriculture, occupying the First Position of Honor at the Doctoral level in Universidad Nacional Agraria La Molina, Peru. With more than 16 years of experience, he is the author and co-author of more than 100 scientific publications and presenter in multiple scientific events. He works as a Researcher at the Instituto de Innovación Agropecuaria de Panamá and as a Professor at several universities. He was one of the winners of the FAO-CLACSO 2023 call: "Innovations for the achievement of food and nutritional security".

Pranay Verma[1*], Saima Mohan[1*], Prof. Gopal Naik[2], Narasinga Rao[2]

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Digital payment realization connecting farmer's producer organization for farm supply management

Agriculture is vital for India's economy and food security with 70% rural population relying on it for livelihood. To address the constraints in agricultural markets and providing quality information, Indian government-initiated Farmer Producer Organizations (FPOs) to strengthen medium and small farmers. After an initial 3 to 5 years of support by government, these FPO face challenges in their financial viability and sustain the growth of their business. About 80% of transactions between FPO and farmer members are still dependent on cash payments, which results in lack of accountability, difficulty in maintaining transparent financial records and transaction history. This can further challenge the ability of farmer members and FPOs to access credit, loans, and other financial services from formal institutions. We also observe that lack of digital payments may also result in missed opportunities for data-driven insights that can be crucial for strategic decision-making and crop planning activities. This may delay the ability of FPOs to analyse market trends, optimize operations and make informed business decisions.

It is observed, farmers exhibit notable reluctance to share their account details, impeding the seamless transition towards digital payment mechanism. Moreover, the inconvenience associated with online ordering and payment entry further discourages their engagement with such systems. Safety concerns regarding user registration and secure handling of card details also contribute to the hesitancy.

To address these concerns, we bring in an improved payment module integrated into our digital farm management and procurement system at the convenience of end users. Here, we provide two different payment options. Option 1, with one-time setup through user registration with a payment partner, prioritizing user safety and card information security. Option 2, offering short-term credit facilitated via banking partners like Kisan Credit card, providing authorization while requiring farmer registration for Buy Now Pay Later (BNPL) or credit lines. With embedded digital payment into the system, it enables providing seamless payment upon order confirmation on inventory bought by farmers and further confirmation for debit payment from account linked thereby reducing the need for manual payment entry.

It further links agriculture advisory services enabling localized and personal farm recommendations based on input supply transactions made. It helps FPO and farmer members discover product demand, price variation, and connect with stakeholders to realize efficient operations, timely order management remotely and optimal management of resources. Such digital transformation further enables availing government incentives, subsidies, and support schemes effortlessly with financial institutions now being able to access to farmers farm information, and their associated financial transactions.

Audience Take Away Notes

- Importance of agriculture and its role in India's GDP growth and food security
- Challenges faced by Farmer Producer Organizations (FPOs) and Farmer members in financial viability, growth, and access to credit
- Socio factors impeding farmers to adopt digital payment, drawbacks of cash payments and the need to transform to digital payment mechanisms
- Benefits of an improved embedded digital payment module for seamless transactions, providing value to access farm advisory services with data driven personalized recommendations for better management of farm, higher yield, and income

Biography

Mr. Pranay Verma, Chief Researcher at Hitachi's R&D Centre in Bengaluru, brings over 17 years of industry experience, showcasing expertise across multiple technological domains, including Smart Spaces, Cloud Computing, Big Data Engineering & Design, Software Architecture, Machine Learning, and Business Incubation. His role primarily centers on spearheading innovative initiatives in technology, capitalizing on a comprehensive skill set and a profound understanding of evolving industry landscapes. His educational background comprises a degree in Computer Science for Engineering and a Postgraduate degree in Business Management.

Ms. Saima Mohan, Senior Researcher at Hitachi's R&D Centre in Bengaluru, with 13 years of industry experience. Her areas of interest and expertise are in Neuroscience, Intelligent Transport Systems, Smart City Spaces with system designing using Big Data analytics, AI/ML, Pattern Recognition and Computer Vision research. She holds a master's degree in biomedical engineering and is pursuing learning in business management. Her current work includes researching business strategy in agriculture spaces.

Namitha Nayak, Rajesh Mehrotra, Sandhya Mehrotra*
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Role of the N-region in targeting multi-transmembrane domain proteins to the chloroplast

In C_3 plants, the oxygenase activity of RubisCO leading to photorespiration and productivity loss can be curbed by introducing cyanobacterial Carbon Concentrating Mechanisms (CCMs). The strategy's first phase envisages the introduction of the bicarbonate transporters (SbtA and BicA) to the chloroplast Inner Envelope Membrane (IEM) to turbo charge RubisCOs CO_2 supply. Targeting BicA and SbtA to the chloroplast IEM needs suitable IEM targeting signals, which are poorly characterized at present. Multiple Transmembrane Domain (TMD) proteins require a non-cleavable targeting signal in addition to the Transit Peptide (TP). We have generated constructs with the SbtA/BicA gene fused to the TP and MPL of Arabidopsis IEM proteins to test this. We find that the chloroplast import and membrane integration of Multi-Transmembrane Domain (TMD)-containing proteins requires an unfolded sequence stretch beyond the transit peptide cleavage site, called the N-region. It is unclear if the N-region acts as an unstructured spacer or if its sequence plays a role in multi-TMD protein targeting. In this study, we have attempted to understand the N-region's role in chloroplast targeting of multi-TMD proteins by employing combinations of transit peptides and N-regions from Arabidopsis chloroplast inner envelope proteins to direct the heterologous multi-TMD protein SbtA to the chloroplast. Protoplast transfection and confocal microscopy imaging assay were used to investigate the sub-cellular localization of the chimeric proteins. We find that the successful import of multi-TMD proteins requires compatibility between the transit peptide and the N-region. Potentially, the N-region's charge distribution contributes to determining its compatibility with the transit peptide. The import potential of a compatible transit peptide- N region pair is specific to the type of cargo TMDs. Furthermore, we find that the transit peptide-N region sequence context plays a role in determining the intra-organellar destination of the heterologous multi-TMD protein. In the absence of a strong IEM signal in the TMDs of heterologous proteins, specific motifs in the N-region, such as the IQLP motif, can direct the protein to the thylakoid membrane. This study uncovers the crucial role of the N-region sequence context in the chloroplast import of multi-TMD proteins and helps us frame guidelines for directing heterologous multi-TMD proteins to specific chloroplast membranes.

Audience Take Away Notes

- This work elucidates the import potential of a compatible transit peptide- N region pair in targeting a heterologous protein to the chloroplast
- The audience can make an informed decision when they design a leader sequence for specific intracellular targeting
- This research indicates an absolute context specificity of molecular targeting sequences in transgenic/basic research
- Absolutely, a comprehensive analysis of several permutations/combinations of N terminal regions and Transit peptides will provide a reference for further research

- In transgenic experiments involving organellar transformation, it is often a serious issue to target a heterologous multi transmembrane domain protein to a specific membrane. Hence this study would greatly help those types of research

Biography

Sandhya Mehrotra obtained a Ph.D degree from NBRI, Lucknow, India where she studied expression of photosynthetic genes, specially RubisCO. In 2005, she NAIST, Nara, Japan, joined as post-doctoral fellows and studied patterns of evolution of Calvin cycle genes. She joined BITS Pilani in November 2008. Her research work involves introducing carbon concentration mechanism in C3 plants and designer promoter in combating abiotic stresses in plants. She has several publications in journals of repute, has received research grants from several funding agencies, reviewed research articles for journals, written book chapters, guided Ph.D students. She has received 2 INSA awards.

Semuel Leunufna
Department of Plant Culture, Faculty of Agriculture, Pattimura University, Ambon, Maluku, Indonesia

Initial activities on bio-prospecting of sky-hold banana (*Musa Troglodytarum L.*): Protection of the rights of indigenous community in Maluku islands, Indonesia

Bio prospecting activities produce multiple beneficial effect not only to human in general but specifically to all stake holders including developed countries and multinational companies involved, developing countries harboring biological diversity and especially indigenous communities preserving biodiversity. The benefits in the area of pharmaceuticals, food, garment industries and others can take form of financial, improvement of knowledge and technical capability through training and technology provisions, material collection and data acquisition through research, and further development into commercial products, preservation of indigenous knowledge and conservation of biodiversity itself for the use of generations to come. A few examples of successful collaborations in bio-prospecting activities in the world have been reported in recent years following its first discussions during the Convention on Biological Diversity (CBD) in Rio de Jenairo, Brazil, 1992. In addition to challenges faced by the current legal activities, illegal activities or bio-piracies are also observed in different countries partly due to the lack of laws and regulations governing the activities.

This presentation described the protocol implemented in bio-prospecting activities related to samples preparation and transfer of sky-hold banana (Musa troglodytarum L.) from Maluku islands Indonesia to the Netherlands, through collaboration among Faculty of Agriculture Pattimura University, PT Olop, Hila Kaytetu, Ambon Island, and Agrofair Company Barrendrecht, the Netherlands. The handling and transporting of biological materials including field and laboratory preparation, packaging, quarantine inspection, shipping and receiving of the materials were successfully completed. However, a number of constrains were identified and suggested to be improved. The protection of rights of indigenous community was ensured through the signing of a Material Transfer Agreement (MTA). This report/study has been the first attempt to propose the bio-prospecting protocol in Maluku Province, Indonesia.

Keywords: Bio-Prospecting, Indigenous Knowledge, Convention of Biological Diversity, Musa Troglodytarum L., Maluku Islands, Material Transfer Agreement (MTA).

Audience Take Away Notes

- Theoretical aspects of bio-prospection; definition, activities, benefits and challenges
- Potential of banana species especially sky-hold banana/pisang tongkat langit, Musa troglodytarum; growing area, environmental specification, nutritional content
- Possible future development of the species and bio-prospecting procedure implemented
- Opportunity and Challenges faced
- Constructive collaboration among institutions involved
- The information and data provided will improve the knowledge and trigger discussions among

participants on the topic, improve the awareness on the important of existing biodiversity and promoting their conservation and sustainable use

- The lecturers could use the knowledge in teaching and improving the awareness of students on the topic, promoting further researches and involvement of their institutions in promoting laws and regulations regarding bio-prospecting, biodiversity conservation and protection of the rights of indigenous communities related to biodiversity
- The institution could assist to ensure the availability of financial support regarding bio-prospecting especially on the research, indigenous communities and their knowledge and practices on biodiversity conservation, etc

Biography

Dr. Semuel Leunufna completed his PhD program at the Martin Luther University (MLU) Halle-Wittenberg, and at the Institute for Plant Genetics and Crop Plant Research (IPK) Gatersleben, Germany on plant genetic conservation in 2004, earned a MSc. in Plant Breeding from the Crop Science Department of the University of Guelph, Guelph, Ontario, Canada in 1995. After one year job as a scientific staff at the IPK Gatersleben, he returned to Indonesia and work at the Faculty of Agriculture Pattimura University. Dr. Leunufna has published more than 70 scientific research articles in various international journals and book chapter in addition to a great number of popular scientific publications, invited as a speaker and keynote speaker at different international scientific conferences, both virtual and in person.

Shumaila Shahid
Division of Plant Pathology, ICAR-Indian Agricultural Research Institute, New Delhi-110012, India

Nanotechnology as a promising tool in the management of Fusarium oxysporum causing Fusarium wilt of cucurbits through green synthesized titanium dioxide nanoparticles

Nanotechnology is a novel branch that has revolutionized the world through its applications in agriculture including plant disease management. It has turned out to be a promising tool to control several important plant diseases of which Fusarium wilt disease is of utmost importance. The causal pathogen of Fusarium wilt disease i.e. Fusarium oxysporum is considered as one of the most destructive plant pathogens. In cucurbits, Fusarium oxysporum causes huge losses both in terms of quantity as well as quality. Current plant disease management practices depend mostly on toxic chemicals which are potentially harmful to humans as well as environment. Nanotechnology can offer advantages over chemical fungicides to control the plant diseases and help in contributing towards reducing the chemical input in agriculture which can pose positive environmental impacts. Fusarium oxysporum is a soil and seed borne pathogenic fungus which is very difficult to manage. Several nanoparticles (NPs) such as metal and metal oxides NPs of titanium, silver, copper, zinc, gold, etc. have been successfully evaluated for antifungal activity against the pathogen. Nowadays, more focus has been put on the green synthesis of NPs as it is environmental friendly, inexpensive, stable, and effective too. In view of the eco-friendly and effective effects of NPs, titanium dioxide nanoparticles (TiO2 NPs) have been synthesized from the mung bean plants through green synthesis approach and antifungal efficacy of the synthesized TiO2 NPs was tested at several concentrations against Fusarium oxysporum causing Fusarium wilt of cucurbits. 100 ppm proved to be the best concentration of TiO2 NPs which gave maximum suppression (70%) of the wilt pathogen which evidenced its potential in the control of this destructive pathogen causing Fusarium wilt of cucurbits. Hence, the synthesized titanium dioxide nanoparticles gave a promising result as a fungicidal activity and could be a novel option of future new generation fungicide which can be environmental friendly too.

Keywords: Nanotechnology, TiO2 NPs, Fusarium oxysporum, Cucurbits, Management

Audience Take Away Notes

- Audience will be able to know the importance of the plant diseases, losses caused by them and the applications of nanotechnology in plant pathology. This knowledge will help them to prevent the losses caused due to fungal diseases if they will grow the cucurbits.

- If the audience are in the jobs related to agriculture or plant sciences, this presentation will enable them to kow about the importance of the nanoparticles in the management practices of several crops which they can follow.

- Other faculty can also use this knowledge to expand their research or teaching.

- In order to provide a solution to every problem, one should understand the root-cause and the presentation will help understand the root-cause of the problem.

- It will definitely provide new information and future prospects which will help the researchers to have a research oriented perspective.

- The listeners including those who are working on this aspect will get all the benefit from the presentation because the presentation will cover all the points related to its importance, its constraints as well as solutions of the problems.

Biography

Dr. Shumaila Shahid received her M.Sc. and Ph.D. in Plant Pathology from Aligarh Muslim University, Aligarh, India in 2008 and 2018, respectively. She is currently working as Scientist (ARS- Agricultural Research Service) in the Division of Plant Pathology, ICAR-Indian Agricultural Research Institute, New Delhi, India. She is Co-Principal Investigator of 6 ongoing major research projects at IARI and has also successfully completed 3 major research projects at IARI. She has 13 years of experience in research and teaching (Ph.D. and M.Sc.). She has published many research papers in peer-reviewed International and National Journals, edited books and also published several book chapters. She has been honoured with various prestigious awards such as Scientist of the Year Award 2023, Young Women Scientist Award 2023, Young Woman Researcher in Plant Pathology 2023, Dr. Rajendra Prasad Excellence Scientist Award 2022, Best Paper award 2022, SAAR Young Scientist Award 2021, Young Scientist Award in Plant Pathology 2021, Research Excellence Award 2019, etc. She is editor and editorial board member of many journals. She is a life member of many renowned societies of India.

Somdatta Ghosh
Associate professor. Ecology and Mycorrhizae research section. Dept of Botany (UG &PG); Midnapore College (Autonomous); W.B. India

Arbuscular mycorrhizae in myco-bioremediation of wastelands for sustainable global production

Climate change, marketing of irrigation demanding high yielding crop varieties, low affordability of agrochemicals by marginal farmers, natural calamities leaving a large portion of agricultural lands fallow for seasons or years in some developing countries. This barren condition hampers the soil microbiome and fertility of soil, which surely affecting the global crop production. The conventional chemical input depended agriculture is also leading to lose fertility of soil with loss of beneficial microflora, which are intricate part of the nutrient cycle. Beside this, agrochemicals are affecting the insect diversity, hampering ultimately the ecosystem stability, increase carbon foot print and offer health hazards. In this decade, now we want to move to organic farming; low input or no input, circular or natural agriculture without hampering total productivity.

In this challenge of maintaining sustainability in both soil and production, Arbuscular mycorrhizae (AM) may be a reliable tool. As AM symbiose with most of the crop plants and function surprisingly in nutrient poor dry soil, they may be utilized to convert these fallow or barren lands fertile at a low cost.

AM is not just a substitute of phosphate, they are almost only tool to provide micronutrients to plants; natural bioremediatory agent to reduce soil toxicity, and reduce plant stress in toxic or saline soil; help host plant to overcome drought stress. AM absorb and store the toxic substances in mycelium or plant root by various mechanisms. AM boost up plant immune system and act as a biocontrol agent in pre-inoculation. AM modify the plat root exudates and influence the composition of microflora in hyposphere and rhizosphere. They mostly attract the beneficial microflora or Plant Growth Regulating Microbes (PGPM), which also act as Mycorrhizae Helper Organism (MHO) and thus create a 'Mycorrhizosphere'. The above actions are magnified with time by the 'mycorrhizospheric effect' and leads to soil and ecosystem sustainability.

A case study (field experiment) showed the sustainable conversion of a lateritic wasteland to fertile land, along with crop production with mycorrhizae and no chemical input.

But agrochemicals are intense threat to AM symbiosis and function. High P in soil renders AM inactive. Fungicides hampers AM spore germination, colonization and function. To save the fertility of lands, shift to low input agriculture with mycorrizal inocula is a low-cost excellent option.

Audience Take Away Notes

- Shift to conventional to alternate agriculture without compromising production, utilise wastelands with simultaneous production and bioremediation.to add global production and uplift the rural economy
- Production technology of mycorrhizal inocula, specially, indigenous

- This concluded research can be further expanded in the future with the following aspects s, field-based studies in bioremediation, socioeconomic benefit, isolation and identification and screening for efficiency of local AM isolates, study the effect of climate change on mycorrhizal symbiosis

Biography

Somdatta Ghosh holds an M. Sc in Botany and Forestry; Ph.D in 'Mycorrhizal ecology and Application in forest crops' from Vidyasagar University, India. He is an Associate Professor. 4 Ph.D fellows: 06 project fellows, Field of work. Ecology, Agricultural biotechnology, Soil ecology, Biofertilizer. Publication: 33, Abstract: 119.He has Reviewed 21 leading scopus jounals.

Tetiana Moskalets
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The ability of glycoside hesperidin to inhibit in vitro the process of epithelial-mesenchymal transition: A molecular aspect

This study was conducted with the aim of studying the ability of citrus flavanone glycoside Hesperidin (Hsd) to inhibit the process of epithelial-mesenchymal transition and to clarify the possible mechanisms of its action in vitro. Epithelial-Mesenchymal Transition (EMT) is the transformation of intact epithelial cells into discrete motile ones that occurs in the formation of many tissue types for the time of embryogenesis, as well as during natural wound healing and tissue remodeling. However, along with this, EMT can take place in malignant tissue transformations, including fibrosis and cancer progression. That is why the search for inhibitors, including those of plant origin, aimed at suppressing unwanted abnormal transformations of tissues is relevant.

The study of molecular markers and morphological characteristics of EMT was carried out on human lung epithelial cells A 549, which were cultured according to standard methods. EMT was induced by the cytokine TGF-□1 (2.5 ng/ml), determining mediators and markers of this process in lysates and supernatants using the Western blot method.

It has been investigated that hesperidin (3,5,7-trihydroxyflavanone 7-rhamnoglucoside) in concentrations of 0.5-10 μmol by TGF-□1 treatment reduces expression of mesenchymal proteins in the extracellular matrix, in particular, collagen, fibronectin, □-SMA, and also suppresses the expression of inflammatory and profibrotic markers (CD 222, ADAM 17). On some of them (ADAM 10, HGF), the tested concentrations of flavanone have an ambiguous effect. Hsd reduces the phosphorylation of Extracellular Signal-Regulated Kinase (ERK) and thus disrupts the phosphorylation of proteins of the Smad 2, 3 family-signal modulators of the transcription of the target genes of fibrosis and inflammation, in particular the synthesis of collagen and a-SMA, which indicates inhibition of the transition of epithelium to mesenchyme. Hesperidin on the background of TGF-□1 treatment suppresses some transmembrane glycoproteins, in particular Integrin □v, N-cadherin. High concentrations of Hsd leads to an increased expression of the epithelial marker E-cadherin. The study showed that Hsd has the ability to reduce EMT due to inhibition of key mesenchymal markers as well as fibrosis and inflammation proteins, which confirms the promising therapeutic prospect of citrus flavanones in the context of treating fibrosis and carcinogenesis.

Audience Take Away Notes

- The audience will learn new information about the molecular mechanisms of inhibition of the process of epithelial-mesenchymal transition by the flavanone glycoside hesperidin
- The obtained information may be useful for the use of hesperidin for experimental and therapeutic purposes, in particular, during the treatment of fibrotic diseases, inflammatory processes, as well as cancer

Biography

Dr. T. Moskalets studies indicators of the nutritional value of agricultural plants and associated with them mechanisms of plant adaptability at the molecular-genetic, organismal, population-species and ecosystem levels. Due to the the Russian-Ukrainian war, at the end of 2022, she has joined the research group of Dr. V. Leksa and Dr. E. Kutejova at the Institute of Molecular Biology of the Slovak Academy of Sciences (IMB SAN) and conducts research on the study of the molecular mechanisms of the inhibitory effect of various plants and their biologically active substances on process of pulmonary fibrosis in vitro. She uses biochemical, molecular, cytological and microscopic research methods to find out the mechanisms of the influence of plant substances on the process of inhibiting pulmonary fibrosis. Her research is currently being conducted and funded within the framework of the program " The stipend for a scientist threatened by the war in Ukraine"–Design code 09I03-03-V01-00113 from 1.1.2023 to 25.10.2025. (SCOPUS ID: 57687150300; ORCID ID: 0000-0003-4373-4648).

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A study on determinants for supply in retail markets by sweet orange farmers in Anantapuramu district of India

India stands at second position after Brazil in sweet orange production. India has a production of 38.94 lakh tonnes of sweet orange. Andhra Pradesh is the leading producer of sweet orange in India with production of 27 lakh tonnes and area of 1.12 lakh ha. (MoA and FW, 2022). In Andhra Pradesh, Anantapuramu district has the highest area of 0.611 lakh ha and production of 14.67 lakh tonnes under sweet oranges. (Agricultural statistics at a glance, Andhra Pradesh, 2020-21). For Data Collection, the Multistage purposive sampling technique was used for selection of state, district, mandals and villages, thereafter random sampling was employed for selection of farmers. From each village 7 participants and 13 non-participants were selected. A total of 63 participants and 117 non-participants participating in retail marketing were selected. In order to find the determinants for supply in retail markets by Sweet orange farmers, Probit regression model was used. The findings shows that, the variables like education, farm size, access to membership in farmers' organisation, access to market information, technical expertise received, experience in farming and distance to retail market were found to have a significant influence on the supply in retail market.

Introduction: Indian agriculture is dominated by innumerable small and marginal farms which are highly dispersed and unorganized. Further, the agricultural goods are extremely perishable in nature and its supply is also erratic owing to seasonality and both biotic and abiotic stresses, these calls for appropriate management of supply chains that can address the emerging issues and facilitates higher value especially in retail markets in India.

Due to the introduction of numerous fresh enterprises, the Indian retail industry has become one of the country's most vibrant and quick-paced sectors. It contributes to over ten percent of the nation's GDP (Gross Domestic Product) and about eight percent of employment. India ranks as the fifth most popular retail destination in the world, with one of the highest rates of retail store accessibility per inhabitant (Kartheka et al., 2019). On the contrary, despite the robust demand and increasing investment in Indian retail market, it was purely due to production of agricultural commodities especially fruits and vegetables.

Sweet orange is an important crop in the Far East, the Union of South Africa, Australia, throughout the Mediterranean area, subtropical areas of South America and the Caribbean. It is produced in many countries around the world especially in warm and tropical weathers. Sweet orange contains large amounts of potassium, which might help to prevent high blood pressure and stroke. The fruit and juice also contain large amounts of a chemical called citrate, which might help to prevent kidney stones. Due to the significance of sweet oranges in human diet, there is a high demand for them in the market. In this background sweet oranges were selected for the current study.

Sweet orange has a world production of 750 lakh tonnes for the year 2020. India stands at second position after Brazil, followed by China and the United States. (FAOSTAT, 2020). India has a production of 38.94 lakh

tonnes of sweet orange. Andhra Pradesh is the leading producer of sweet orange in India with production of 27 lakh tonnes and area of 1.12 lakh ha. (MoA and FW, 2022). In Andhra Pradesh, Anantapuramu district has the highest area of 0.611 lakh ha and production of 14.67 lakh tonnes under sweet oranges. (Agricultural statistics at a glance, Andhra Pradesh, 2020-21). The supply chain is critical in the marketing of perishable foods like fruits. Fruit marketing is difficult due to perishability, seasonality, bulkiness, and consumer buying habits. Furthermore, in the current context, the infrastructure, poor supply chain equity, and traditional small-scale unorganised retailers. The vast majority of the Indian retail market is dominated by unorganised retailers. The recent development in the retailing industry is the emergence of numerous organised retailers.

The bargaining power of farmers can be improved if they enjoy market linkages with retail markets. Further, in view of the perishability of the produce these market linkages help in timely transaction of produce. Therefore, it is essential to understand supply chain and also to find the determinants that influence the farmers to supply sweet orange in retail market. So, the study "Determinants for supply in retail markets by sweet orange farmers in Anantapuramu district" was conducted, with the following objectives.

- To study the supply chain models for transacting sweet oranges in retail markets in India
- To study the determinants for supply in retail markets by sweet orange farmers in India.

Materials and Methods: Multistage purposive sampling technique was followed for selection of state, district, mandals and villages, thereafter random sampling was employed for selection of farmers. In India, Andhra Pradesh state was selected for the study as it has the highest area of 0.87 lakh ha and production of 18.78 lakh tonnes of sweet oranges by considering average of past seven years data. (Agricultural Statistics at a Glance, Andhra Pradesh). In Andhra Pradesh, Anantapuramu district was selected for the study as it has the highest area of 0.5 lakh ha with production of 10.96 lakh tonnes of sweet oranges. (Directorate of Economics and Statistics, 2021-22). In Anantapuramu district, according to the data obtained from Department of Horticulture, Anantapuramu; out of sixty-nine mandals, three mandals with a maximum area under sweet orange cultivation were selected purposively, which included Putluru, Yellanur, Narpala. Three villages from each mandal were selected, based on the highest area under sweet orange production. Komatikuntla, Venagannapalli, Putluru villages from Putluru mandal; Vennapusapalli, Nitturu, Venkatampalli villages from Yellanur; Narpala, Ganganapalli, B. Poppuru villages from Narpala mandal were selected. From each village seven participants and 13 non-participants were selected. A total of 63 participants and 117 non-participants participating in retail marketing were selected. The following tool was used for analysing the data collected.

1. Mapping technique was used to find all the supply chains involved in moving of sweet oranges from farmers to the consumers.
2. Probit Regression Model was used to study the determinants for supply in retail markets by sweet orange farmers in Anantapuramu district. Probit Regression Model is used in cases when the dependent variable is dichotomous, or has an upper and lower limit (symbolically, Y=1,0). (Noreen, 1988). Provided the functional form can be specified correctly, classification of the dependent variable into upper limit and lower limit provides enough information, along with observed values of the independent variables, to permit estimation of the unknown parameters. Since the underlying latent propensity/probability of treatment (y*) is unobserved, the assumption of normal distribution of errors (□) with zero mean is made in order to use maximum likelihood estimation. In the Probit Regression Model, the latent probability (y*) is modelled as a linear combination of the predictors, ession:

$$y^* = \sum_{k=0}^{k=n} \beta_k x_k + \varepsilon, \quad \varepsilon \sim N(0, \sigma^2)$$

Where;

y^* = Latent Propensity

β_k = Regression Coefficients (□ = 0 for Constant)

x_k = Independent Variables

n = Number of Independent Variables

□ = Error Term

Based on y*, the value of the dependent variable yi (Supply of sweet orange fruit in retail markets) is stated

$$y_i = \begin{cases} 0 \; if \; y* \leq 0 \\ 1 \; if \; y* > 0 \end{cases}$$

It is to be noted that in all the regression analyses, only those variables that give the best fit, with least possibility of errors and multi-collinearity among them will be identified.

Dependent Variable- Retail market participation decision. (1-decide to participate, 0- decide not to participate)

Independent Variables: x1–Farmer's experience (Years); x2 – Education (Illiterate-0, Literate-1) (Illiterate- less than 5th standard, Literate- studied above 5th standard); x3 – Size of land holding (Ha); x4 – Access to market information (1-Availability of market information, 0- non-availability of market information); x5 – Access to membership in Farmers' organizations (1- there is access to membership in Farmers' organizations, 0- there is no access to membership in Farmers' organizations); x6 – Distance to retail market (Kms); x7 – Gender (1- Male, 0- Female); x8 – Technical expertise received (1- Technical expertise received, 0- technical expertise not received); x9 – Access to extension services (1- there is access to extension services, 0- there is no access to extension services)

Results and Discussion:

I) Supply Chain Model for Transacting Sweet Oranges: The sweet orange supply chain is intricate and contains a large number of actors, each of whom is linked to others both within and across different supply chains. In order to map out the chain, the first stage in the supply chain is to identify the players and then follow the links between them (Figure 1). This supply chain analysis aids in examining the expenses incurred and profits made by each player, both of which are used to determine the price spread, producer's share in consumer's rupee and marketing efficiency.

Actors/Players in Supply Chain								
Functions	**Input Suppliers**	**Farmers**	**Pre-harvest Contractor**	**FPO**	**Commission Agent**	**Wholesaler**	**Retailer**	**Retail Mall**
Input Supply								
Production								
Assembling								
Grading								
Packing								
Retailing								

Figure 1. Functions of actors in sweet orange supply chain.

Actors Involved in Supply Chain of Sweet Orange: Detailed explanation of the actors involved in the supply

chain of sweet orange and their role are given below and also in the figure.2.

Input Suppliers: Private suppliers that provide planting material, machinery, insecticides, fertilizers, manures and other inputs are considered input suppliers, as are government agencies. Credit for agriculture is also regarded as an input in this case. The production of sweet orange that are of good quality depends heavily on these input sources.

Farmers: The majority of farmers in Anantapuramu who cultivate sweet orange are semi-medium farmers with area 2 to 4 hectares of land. Most of the farmers sell the orchard's harvesting rights to pre-harvest contractors. A very few of the farmers sell their produce to retail malls, mostly with the hope of earning more profits. The dominance of the contractual system is due to a number of factors, including the need for quick income to cover urgent family expenses, mitigating price risk, the inconvenience of self-marketing, lack of experience, managing labour and produce marketing.

Pre-harvest Contractor: These are the people who buy the produce directly from the farm field, as the trading of sweet orange is particularly seasonal. They sell the produce to wholesalers from different places like Delhi, Mumbai, Hyderabad, Chennai, Bangalore, etc. By keeping tight ties between the wholesaler and the farmers, these pre-harvest contractors play a crucial part in the marketing of sweet orange. The pre-harvest contractors estimate the total quantity of production while making contract with the farmer and evaluate the anticipated marketing expenses (supervision, harvesting, shipping and transaction costs). The pre-harvest contractors also took into account the needs for internal consumption, labour charges and also pre and post-harvest losses.

FPO: FPOs are the farmers organizations which were formed by the group of likeminded farmers to get better profits by way of collective sale. These FPOs purchase the produce from the farmers and sell it to the wholesaler from nearby major cities like Bangalore, Chennai, Hyderabad, etc. These FPOs are non-profit organizations, hence they do not take high market margin, and provides a better price for the farmer.

Commission Agent: They are the intermediaries between farmers and wholesalers. They do not take the possession of the produce, instead they procure the sweet oranges from the farm field and transport the produce to the nearest city where the produce is handed over to the wholesaler. They charge commission from both the producer and wholesaler.

Wholesaler: The wholesalers deal with large quantities of sweet orange. They procure the produce from different agents like pre-harvest contractors, commission agents and FPOs, intern selling it to different retailers. As they deal with large quantities of sweet orange, they have good storage facilities and they separate the produce according to different grades.

Retailer: Being at the end of the supply chain, they serve as intermediaries to make the produce readily available to consumers. The majority of retailers that sell sweet oranges do it on foot, in vans and on barrows (hand carts). They circulate from street to street selling sweet orange. Additionally, a large number of retailers can be seen at town centers such railway stations, bus stops, and areas near courts, schools and hospitals. Due to the highly perishable nature of the acquired fruit, there is intense competition among retailers to totally dispose of it. Now, proper stores created especially for sweet oranges and other perishable products are beginning to appear in large towns. They are the one who packs the produce in small quantities that are preferred by the consumer.

Retail Mall: It is a business or person that collects sweet orange directly from the farmers and sell it to consumers. Here harvesting is done by the retail malls according to their quality requirement. They are

providing the farmers with highest price in Anantapuramu. As they are the only intermediary involved in the supply chain, they perform all the activities like harvesting, assembling, grading, packing and retiling.

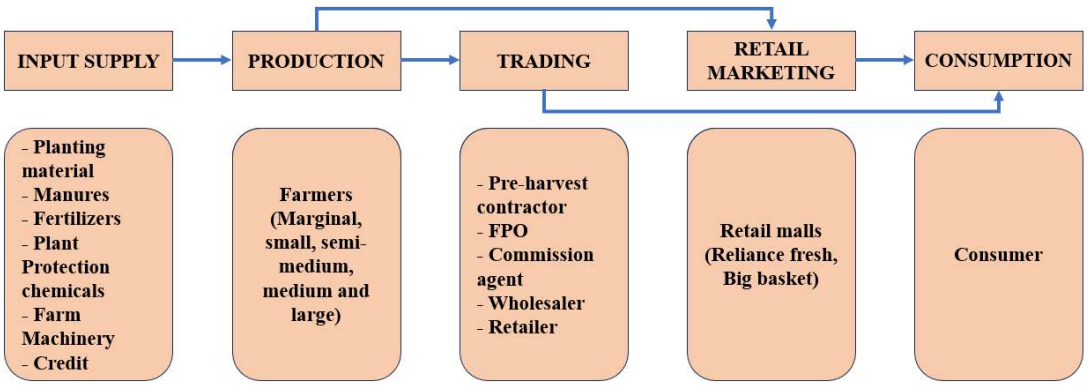

Figure 2. Supply chain mapping of sweet orange:

The entire process from the point of flow of materials and resource services to the farmers up to the final delivery of produce to the ultimate consumer was portrayed through a supply chain map (Figure 2), based on the roles played by various actors in the supply chain of sweet orange. The information obtained from the farmers and different intermediaries through pre-tested questionnaire formed the basis for the structure of this map. Rectangles are used to symbolize the supply chain functions or important phases which was done by key players. These key players who were involved in carrying out each function and the inputs that are used in the cultivation of sweet orange was mentioned below the rectangles.

Probit regression model was used to analyze the determinants for supply in retail markets by sweet orange farmers in Anantapuramu district, and the results were presented in Table 1. The Pseudo R2 value was 0.85, this showed that selected independent variables explained 85 per cent of the change in dependent variable.

Experience of the farmer in farming: Experience of the farmer in farming showed negative relationship with supply of sweet orange in retail markets and was found to be statistically significant at one per cent level of significance (LOS). The negative co-efficient indicated that experience of the farmer in farming and supply to retail market had a negative relationship. The marginal value of -0.078 for this independent variable indicated that the probability of supply to retail market decreased by 7.8 per cent with one year increase in the experience of the farmer in farming. Less experienced farmers were more likely to supply sweet orange to retail markets than more experienced farmers. As farmers experience increased, risk aversion rises and there is less interest in supplying sweet orange to retail markets. Less experienced (young) farmers were regarded to be more creative and innovative, which gives them better access to market intelligence. The results were similar with Haile et al. (2022), Olutumise (2022) and Gebre et al. (2022).

Education of the farmer: Education of the farmer showed positive relationship with supply of sweet orange in retail markets and was found to be statistically significant at five per cent LOS. The positive co-efficient indicated a positive relation between education of the farmer and supply of sweet orange in retail markets. The marginal value of 0.236 denoted that probability of supplying sweet orange to retail markets increased by 23.6 per cent with increase in education level of farmer. Higher education enabled farmers to supply sweet orange in retail market with greater ease, information and expertise gained during the course of formal education might have helped them see progressive pathway with an eagle's eye. These results were consistent with Degefa et al. (2022), Konja and Mabe (2023), Olutumise (2022) and Abadega (2020).

Farm size: Amount of land owned by the farmer had a positive relation with supply sweet orange in retail market and was found to be statistically significant at five per cent LOS. The co-efficient showed a positive corelation between land size and decision to supply sweet orange to retail markets. The marginal value of 0.056 implied that probability of supplying sweet orange to retail markets increased by 5.6 per cent with every one hectare increase in land owned by the farmer. With increase in land size, the production of sweet orange also increased. As production increases, marketing power of the farmer increases, also farmer will be willing to take risks and risk absorbing capacity is greater. The results were aligned with findings of Degefa et al. 2022, Olutumise (2022) and Gebre et al. (2022),

Access to membership in farmers' organisation: Farmers membership in farmers' organisation showed positive and statistically significant relationship with supply sweet orange in retail market. It was positively significant at five per cent LOS. This showed a beneficial association between membership and farmer's supply decision. The marginal value of 0.263 for this variable indicated that probability of supply sweet orange in retail market increased by 26.3 percent with increase in access to membership in farmers' organisation. Farmers who belonged to anyone of the farmers' organization had a greater access to Market intelligence and possess higher market coverage. The results obtained were found to be similar with findings of Konja and Mabe (2023) and Haile et al. (2022).

Access to market information: Access to market information was found to have a statistically significant positive relationship with supply of sweet orange to retail markets at five per cent LOS. This suggested a beneficial association between farmers' supply decision and access to market information. The marginal value of 0.169 showed that probability of supply of sweet orange to retail markets increased by 16.9 per cent with increase in access to market information. Farmers' who were aware of retail marketing, price per tonne of sweet orange and the associated benefits, were more inclined to supply sweet orange to retail markets. The studies of Degefa et al. (2022) and Olutumise (2022) were also found to be similar to the results obtained. Distance to retail market: Distance to retail market was negatively correlated with supply of sweet orange to retail market at five per cent LOS. This showed a negative relation between distance to retail market and supply of sweet orange to retail markets. The marginal value of -0.002 indicated that probability of supplying sweet oranges to retail market decreased by 0.2 per cent with one kilometer increase in distance to retail market. When distance to retail market increases so will the transportation cost associated with moving produce from farmers' field to market. As transportation cost increases, net returns will be decreased. Similar results were reported by Konja and Mabe (2023), Haile et al. (2022) and Olutumise (2022).

Technical expertise received: Technical expertise received by the farmers from retail markets was found to have positive and statistically significant relation with supply of sweet orange to retail markets at five per cent LOS. The co-efficient obtained indicated a positive relationship between technical expertise received and supply decision of farmer. The marginal value of 0.309 for this independent variable showed that probability of supplying sweet orange to retail market increased by 30.9 per cent with increase in technical expertise received. Technical expertise provides detailed information regarding retail marketing like price, how to market the produce, where to supply, benefits available, etc. allowing the farmer to have a better understanding of retail marketing. The findings of Mengstu et al. (2023), Melese et al. (2018) and Gebre et al. (2022) were also similar to the results of this study.

Table1. Determinants for supply in retail markets by sweet orange farmers.

Variables	Co-efficient	Std. Error	P-Value	dy/dx
Experience in farming	-0.484	0.0269	0.004	-0.078**
Education	1.747	0.100	0.019	0.236*
Farm size	0.348	0.025	0.027	0.056*
Access to membership in farmers' organisation	1.665	0.126	0.037	0.263*
Access to market information	1.469	0.084	0.042	0.169*
Gender	-0.943	0.255	0.374	-0.227
Distance to retail market	-0.009	0.001	0.043	-0.002*
Technical expertise received	1.738	0.139	0.026	0.309*
Access to extension services	-1.137	0.088	0.806	-0.022
Pseudo R2	0.8495			
Log likelihood	-17.54			
Number of observations	180			

Note: ** significant at one per cent level of significance, * significant at five per cent level of significance.

Summary and Conclusion: The sweet orange supply chain is intricate and contains a large number of actors, each of whom is linked to others both within and across different supply chains. In order to map out the chain, the first stage in the supply chain is to identify the players and then follow the links between them. Input suppliers, farmers, pre-harvest contractor, FPO, commission agent, wholesaler, retailer and retail mall are the players identified. The entire process, from the point of flow of materials and resource services to the farmers up to the final delivery of produce to the ultimate consumer, was portrayed through a supply chain map.

On the other hand the Probit regression analysis showed that the model was a good fit for the collected data. All the independent variables selected were statistically significant. Out of which experience and distance had negative and significant effect, implying that the probability of participation in retail marketing of sweet orange will decrease when experience and distance increase. Education farm size, access to membership in farmers' organisation, access to market information and technical expertise received had positive and significant effect on supply decision of the respondents. This implied that the probability of participation in retail marketing of sweet orange increased when the above-mentioned independent variables increased.

Keywords: Supply Chain, Retail Marketing, Probit Regression Model.

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Study on resource use efficiency of redgram production in Karnataka

Redgram (Cajanus cajana) is one of the most important pulse crops in the tropics and sub-tropical regions of the world. Redgram occupies an area of 16 lakh ha with a production of 12 lakh tonnes during 2020-21 in Karnataka. The main objective of any production unit is the better co-ordination and utilization of various resources to realize greater returns an attempt was made to analyze the productivity of various resources in the production of redgram under organic and inorganic farmers separately. The Cobb-Douglas production function was used to analyse the resource use efficiency levels. The findings shows that, the resources like seeds, FYM, vermicompost, biopesticide, plant growth harmones, and bullock labour in organic redgram and seeds, FYM and plant protection chemicals in inorganic redgram production were underutilized. Similarly, biofertilizer, human labour, and machine labour in organic and fertilizers, human labour, machine labour, and bullock labour in inorganic redgram production were over utilised. Thus, most of the inputs were used indiscriminately in the redgram production. Further, the findings were also focused on the farm efficiency analysing using Data Envelopment Analysis method, it shows that, more than 50 per cent of the sample farmers were operating above 70 per cent efficiency level across the study area. However, only a few farmers (<30%) were operating below 70 per cent efficiency level.

Keywords: Organic, Inorganic, Production, Redgram, Resource Use Efficiency.

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The new player in the fight for plant regeneration: WOX5

Somatic Embryogenesis (SE) exemplifies the unique developmental plasticity of plants. In SE, the already differentiated somatic cells can enter a new embryogenic developmental pathway to form a functional somatic embryo. For years, SE has been widely explored in plant biotechnology for micropropagation and genetic transformation of plants.

During SE, a complete plant is regenerated from specific somatic cells that respond to SE-inductive conditions, most frequently, auxin treatment. Understanding the molecular signature of the SE-responsive explant cells is of central interest in research on cell pluripotency/totipotency. In Arabidopsis, like in other plants, a very limited number of explant cells can respond to SE-inductive treatment and undergo embryogenic development in vitro. So far, a highly heterogeneous cell population that consists of both embryogenic and non-responsive explant cells has been analyzed in studies on SE. To overcome the current limitations in studies on SE related to the heterogenic developmental status of the analyzed explant cells, we implemented a novel analytical approach, the FANS (fluorescence-activated nuclei sorting) method, in studies on SE. The FANS method was adopted and used for nuclei isolation from SE-responsive explant cells of Arabidopsis. A highly homogenous population of embryogenic cells that was obtained with the FANS method was used in RNA-seq analyses. The candidate molecular determinants of cell pluripotency/totipotency were identified. The results revealed a few highly upregulated (FC>5; $p<0.05$) genes on the 3rd day of SE induction, including several genes encoding transcription factors. The candidate TFs functions are related to stem cells maintenance, cells proliferation, and differentiation. One of the candidate gene was WUSCHEL-RELATED HOMEOBOX 5 (WOX5). WOX5 is a member of the WUSCHEL family of homeodomain transcription factors, required for Quiescent Center (QC) function and columella stem cell maintenance in the root meristem has been recognized for its pivotal role in pluripotency acquisition during somatic embryo formation in plant tissue culture. Our study reveals that WOX5 can control the pluripotency of somatic cells which is manifested in SE process. During SE WOX5 is involved in maintaining auxin homeostasis by regulating auxin biosynthesis and distribution. This finding advances the understanding of WOX5's crucial role in maximizing in vitro plant regeneration. The collective evidence underscores WOX5's role in influencing somatic embryo formation, thereby deepening our understanding of plant development and offering potential applications in biotechnology and agriculture.

Audience Take Away Notes

- **Somatic Embryogenesis (SE):** Understanding the process and its significance in plant biotechnology, including the role of auxin treatment in inducing SE
- **Cell Pluripotency/Totipotency:** Insights into the molecular signature of SE-responsive explant cells and the importance of cell plasticity
- **FANS Method:** Introduction to the Fluorescence-Activated Nuclei Sorting method and its application in isolating homogeneous embryogenic cell populations

- **Molecular Determinants:** Identification and functions of key transcription factors involved in SE, particularly focusing on WOX5 and its role in maintaining auxin homeostasis and pluripotency during SE
- Biotechnologists and Genetic Engineers can apply the knowledge of SE method to improve micropropagation techniques and genetic transformation protocols, potentially increasing efficiency and success rates
- **Plant Biologists:** The insights into cell pluripotency and the role of specific transcription factors, like WOX5, can guide further research on plant development and tissue culture methodologies
- **Agricultural Scientists:** Understanding the mechanisms of SE can aid in developing crops with enhanced traits, improving agricultural productivity and resilience
- **Enhanced Techniques:** Improved methods for plant regeneration and genetic modification will streamline laboratory procedures and field applications, leading to more robust and scalable solutions in plant biotechnology
- **Innovative Research:** The knowledge of key molecular determinants in SE can inspire new research directions, potentially leading to groundbreaking discoveries in plant science
- **Practical Applications:** The ability to manipulate SE processes can lead to the development of superior plant varieties, addressing global challenges like food security and climate change adaptation
- **Educational Advancement:** Incorporating the latest research into teaching materials will enhance the quality of education, preparing students to tackle contemporary issues in plant science and biotechnology
- This research could be used by other faculty to expand their own research or teaching
- **A Model System:** SE in Arabidopsis serves as an excellent model for studying cell pluripotency and differentiation, which can be extrapolated to other plant species
- **Advanced Techniques:** The FANS method and RNA-seq analysis are cutting-edge techniques that can be adopted and adapted for various research projects in plant science
- **Collaborative Potential:** The findings on WOX5 and other transcription factors open up avenues for collaborative research to explore their roles in different contexts and species

Biography

Dr. Wójcik studied Biotechnology at the University of Silesia in Katowice, Poland and graduated as MS in 2013. She then joined the research group of Prof. Gaj and she received her PhD degree with the distinction in 2018 at the same institution. She is the author of 15 scientific articles, published between in high-impact journals between 2018 and 2024. She led 2 projects funded by the Polish National Science Centre (NCN). In 2021, she completed a postdoctoral internship at the Gregor Mendel Institute in Vienna founded by the Polish National Agency for Academic Exchange. Dr. Wójcik actively participates in scientific outreach and educational activities.

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RLB (Rice Lateral Branch) recruits PRC2-mediated H3K27 tri-methylation on OsCKX4 to regulate cytokinin homeostasis and lateral branching in rice (*Oryza sativa L.*)

Lateral branches such as shoot and panicle are determining factors and target traits for rice (Oryza sativa L.) yield improvement. Cytokinin promotes rice lateral branching, however, the mechanism underlying the fine-tuning of cytokinin homeostasis in rice branching remains largely unknown. Here, we report the map-based cloning of Rice Lateral Branch (RLB) encoding a nuclear-localized, KNOX-type homeobox protein from a rice cytokinin-deficient mutant showing more tillers, sparser panicles, defected floret morphology as well as attenuated shoot regeneration from callus. RLB directly binds to the promoter and represses the transcription of OsCKX4, a cytokinin oxidase gene with high abundance in panicle branch meristem. OsCKX4 over-expression lines phenocopied rlb, which showed upregulated OsCKX4 levels. Meanwhile, RLB physically binds to Polycomb Repressive Complex 2 (PRC2) components OsEMF2b and co-localized with H3K27me3, a suppressing histone modification mediated by PRC2, in the OsCKX4 promoter. We proposed that RLB recruits PRC2 to the OsCKX4 promoter to epigenetically repress its transcription, which suppresses the catabolism of cytokinin, thereby promoting rice lateral branching. Moreover, antisense inhibition of OsCKX4 under the LOG promoter successfully increased panicle size and spikelet number per plant without affecting other major agronomic traits. This study provides insight into cytokinin homeostasis, lateral branching in plants, and also promising target genes for rice genetic improvement.

Audience Take Away Notes

- RLB is a Homebox gene
- RLB can directly target OsCKX4 and inhibit its expression
- Osckx4 overexpression materials and RLB have similar phenotypes. Antisense inhibition of osckx4 can increase the number of secondary branches, and then increase the number of grains per spike
- RLB can interact with PRC2 member emf2b to introduce PRC2 into the osckx4 promoter, and inhibit its transcription, thereby inhibiting cytokinin metabolism

Biography

Dr. Tong graduated from Zhejiang University with a bachelor's degree and studied plant pathology in ZheJiang University. She received her PhD degree in 2010. After that, she worked as a postdoctoral in the Institute of Plant Physiology and Ecology, Chinese Academy of Sciences Shanghai Branch, and obtained the position of associate professor. Now she works at the China Rice Research Institute. She has published more than 30 research articles in SCI(E) journals.

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Photosynthetic bicarbonate photolysis masked by the rapid oxygen isotopic exchange between water and bicarbonate

Plant photosynthesis is the most important biochemical reaction on Earth. It drives the biogeochemical cycle of all elements on Earth and is the only chemical process in nature that can convert light energy into chemical energy. The photosynthetic oxygen evolution is a key step in photosynthesis, continuously providing oxygen for global organisms. There is currently much debate about the photosynthetic oxygen evolution theory of plants. Specifically, whether the photosynthetic oxygen evolution of plants comes from water or bicarbonate, or both. This photosynthetic theory is based on the classic photosynthetic oxygen evolution experiment labeled with 18O by Ruben et al.. The premise of this conclusion is that there is little or no exchange of oxygen isotopes between bicarbonate and water during photosynthetic oxygen evolution in plants. However, chloroplasts contain diverse carbonic anhydrases, and the dehydration and hydration of thylakoid carbonic anhydrase depend on pH. These characteristics of photosystem and thylakoid carbonic anhydrase allow rapid isotopic exchange of oxygen between OH, COOH, O-O, C=O, and other groups in the photosynthetic oxygen evolution system labeled with 18O. We used bi-elemental (carbon and oxygen) bidirectional isotope tracer culture technology to demonstrate that, depending on the culture conditions, microalgae undergo complete, partial, or completely no exchange of oxygen isotopes between bicarbonate and water during photosynthesis. This indicates that the possibility of bicarbonate photolysis releasing oxygen cannot be excluded during photosynthesis. Bicarbonate photolysis can better explain the bicarbonate effect, where the oxygen evolution rate of Hill reaction increases several times or even more than ten times under the stimulation of bicarbonate. The complete exchange of oxygen isotopes between bicarbonate and water can reasonably explain the 18O labeled experiments of photosynthetic oxygen evolution so far, with the theory of equal contribution of bicarbonate photolysis and water photolysis in photosynthetic oxygen evolution. It is also powerful evidence for modifying the Kok-Joliot cycle model into a new model involving one bicarbonate molecule and one water molecule. The completely no exchange of oxygen isotopes between bicarbonate and water can reasonably explain the Dole effect, where the 18O enrichment of O_2 in the atmosphere is nearly 24‰ higher than that in seawater. In addition to oxygen evolution, bicarbonate photolysis is also the starting point of photosynthetic inorganic carbon assimilation. The equal contribution of bicarbonate photolysis and water photolysis in photosynthesis provides a theoretical basis for the construction of a new type of artificial photosynthetic reactor coupling light and dark reactions.

Audience Take Away Notes

- This study will help the audience better understand the photosynthesis of plants, the carbon biogeochemical cycle, and the Dole effect
- This study will help the audience better understand the process of photosynthetic oxygen evolution in plants, as well as the bicarbonate effect and the Kok-Joliot cycle during photosynthetic oxygen evolution

- This study will help the audience better understand the coordination between the light reaction and the dark reaction during photosynthesis
- This study provides a practical solution to the construction of a new type of artificial photosynthetic reactor coupling light and dark reactions

Biography

Professor Yanyou Wu received Ph.D. degree from Sichuan University (1994). In the early years, he mainly devoted himself to explaining the fertility of some intergeneric hybrids with "cell fusion-chromosome set segregation" and the extended genetic laws. In recent 30 years, his research focuses on interdisciplinary of biology, geology and physics, such as Biogeochemistry and Karst ecology, the application and determination of electrophysiological information in plants. He has published 15 monographs and more than 100 articles in SCI(E) journals, and hplds more than 100 invention patents of China. His recent interest is photosynthetic oxygen evolution (bicarbonate photolysis) and biogeochemical cycle of carbon.

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Medicinal desert plants as a valuable source of phytochemicals for cosmetic application: Biochemical analysis and in-vitro biological activities

In Morocco, the medicinal plant sector is endowed with a great biodiversity of medicinal flora characterized by several therapeutic benefits, setting up an important resource of natural ingredients widely suitable for cosmetic formulations. In this work, we highlight a case study conducted on some native plants highly used by the local population in traditional medicine in the south of Morocco. We evaluated the chemical composition of the obtained plant extracts using the LC-MS/MS, their antioxidant potential, as well as their dermo-cosmetic properties (anti-tyrosinase, anti-elastase, anti-collagenase, and anti-hyaluronidase activities).

Our findings showed a potential anti-aging effect of plant extracts due to their chemical profile rich in flavonoid aglycones and glycosides1,2. The content of these bioactive molecules is primarily influenced by biotic and abiotic stressors, which play a primordial role in stimulating the biosynthetic pathways of secondary metabolites. The results suggest that indigenous plants of the southern regions of Morocco are potential sources for the development of cosmetic & wellness products. Given the scarcity of these remarkable species in the desert area of Morocco and its wealth of bioactive compounds, particularly flavonoid glycosides, the use of alternative methods like advanced biotechnological tools is highly recommended for intensive plant species propagation and biodiversity conservation.

Keywords: Abiotic factors, Anti-aging, Antioxidant, Bioactive molecules, Extraction, Medicinal plants

Audience Take Away Notes

- The audience will get an idea of the potential use of Medicinal desert plants in cosmetic industries and the formulation of well-being products
- Explore new ways of valorization for aromatic and medicinal plants
- This research shows the importance of using indigenous desert plants in different applications by highlighting the relationship between the influence of extraction methods on the yield of the biomolecules, their biological activities, and the understanding of in vitro mechanism of action of these phytochemicals

Biography

Dr. El Kharrassi is an Assistant Professor at the UM6P-ASARI, Laâyoune, Morocco. He joined the UM6P Benguerir campus, AgroBioSciences research program in 2017 as a postdoctoral researcher for two years and has conducted his doctoral thesis under joint supervision "cotutelle thesis" at the University of Burgundy, "Bio-PeroxIL", Dijon, France, and the University of Hassan1st, Settat, Morocco. His research interests include the valorization of indigenous desert plants, phytochemistry, natural product chemistry and Plant Tissue Culture. He is also interested in producing natural extracts and essential oils containing valuable molecules, highlighting biological activities, and choosing natural ingredients with these effects. Dr. El Kharrassi has co-authored 30 peer-reviewed articles with a high H-index of 13 with 1010 citations.

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Improvement of the relative quantitative PCR method and its role in transcriptome data validation

Real-time quantitative PCR is a technique that can measure the content of the target nucleic acid sequence of interest in a given sample. It is mainly divided into absolute and relative quantitative methods. The relative quantification is mainly used in gene expressions for functional genomic and transcriptome studies. However, to use this technology accurately, there are some key points to master. First, specific primers need to be designed to ensure amplification of the Gene of Interest (GOI). Second, the appropriate reference gene or reference gene combination has to be selected. Finally, scientific gene expression level calculations and statistics are required to obtain accurate results. Therefore, this work proposes a workflow for relative quantitative PCR and introduces the relevant points so that beginners can better understand and use this technology.

Audience Take Away Notes

- They can use it in researches related to gene expressions or transcriptome data validation.
- It will improve the accuracy of quantitative PCR and help researchers obtain more accurate gene expression data.
- It is suitable for all scientists working in gene expression research.
- It allows researchers to get primers freely without designing by themselves and do not have to worry about the amplification efficiency of primers, which can greatly improve the efficiency of quantitative PCR.

Biography

Dr. Zhiwei Chen graduated from Nanjing Agriculture University for his bachelor's degree on major of Biotechnology in 2004 and master degree on major of Crop Genetics and Breeding in 2007, and he is now studying Microbiology in Nanjing Agriculture University for his doctor's degree. He joined the Biotechnology Research Institute of Shanghai Academy of Agricultural Sciences research in 2007 and obtained the title of associate professor in 2017. He is a master's supervisor at Shanghai Ocean University, and a director of the Shanghai Seed Association and the Chinese Society of Agri-Biotechnology. He has published more than 80 research articles.

BOOK OF ABSTRACTS

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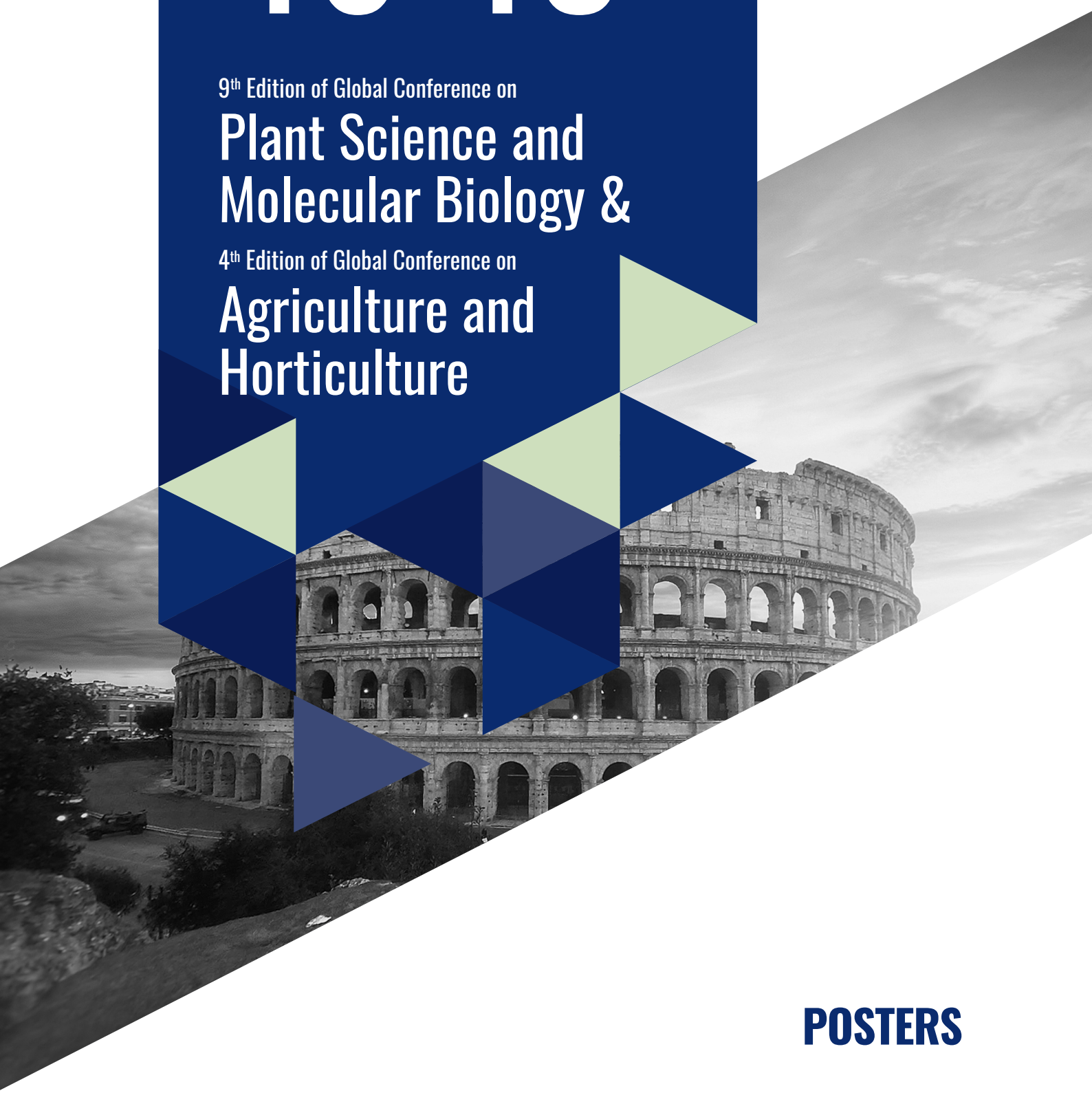

POSTERS

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Microwave assisted extraction of phytocompounds from *Melissa officinalis L* with neuroprotective effect

Cognitive dysfunction is a major health problem in the 21st century, and many neuropsychiatric disorders and neurodegenerative disorders, such as schizophrenia, depression, Alzheimer's Disease dementia, cerebrovascular impairment, seizure disorders, head injury and Parkinsonism, can be severely functionally debilitating in nature. In course of time, a number of neurotransmitters and signalling molecules have been identified which have been considered as therapeutic targets. Neuroprotective food supplements offer a promising alternative to synthetic drugs by promoting brain health and alleviating symptoms associated with various neurodegenerative diseases. Neuroprotection involves various mechanisms, including alterations in enzymatic neuronal activity and activation of particular receptors. The aim of this study is to optimize Microwave Assisted Extraction (MAE) of phytocompounds with neuroprotective activity form Melissa Officinalis L. The extraction efficiency was evaluated by analysing the total content of polyphenols, iridoids, flavonoids, and antioxidant capacity. Phytoextracts were evaluated for their inhibitory capacities against Acetylcholinesterase (AChE) and Butyrylcholinesterase (BuChE). Results showed that MAE led to a significant increase (ANOVA, $p<0.05$) of bioactives extraction yield (33% increase) and a shorter exrtraction time compared to conventional extraction method. The obtained phytoextracts by MAE have shown the highest total content of polyphenols (235.42 mg GAE/g DM), iridoids (3.54 mg AUE/g DM) and flavonoids (236 mg QE/gDM). Furthermore, MAE extracts from lemon balm leaves were found to possess a maximum antioxidant capacity. Screening of the AChE and BuChE inhibitory activities by Ellman´s method showed that the strongest inhibition was achieved for phytoextracts obtained by MAE. The resulting extracts, enhanced in bioactive compounds that exhibit neuroprotective effects, could be used to develop food supplements aimed at preserving brain health and alleviating symptoms linked with various neurodegenerative diseases.
Acknowledgment: This work was supported by a grant from the National Program for Research of the National Association of Technical Universities-GNAC ARUT 2023, project: "Encapsulated phytoextracts from autochthonous plants with neuroprotective properties".

Audience Take Away Notes

- Phytochemicals from medicinal plants play a crucial role in maintaining the brain's chemical balance by influencing the function of receptors for major inhibitory neurotransmitters
- The research focuses on the neuroprotective active phytochemical substances found in medicinal herbs, such as polyphenols, iridoids, flavonoids, and antioxidant capacity
- Potential of phytochemicals as therapeutics and their role in Cognitive health
- An in-depth analysis to identify the neuroprotective components of *Melissa Officinalis L*

Biography

Adina Ionuta Gavrila is Associate Professor at University Politehnica of Bucharest and has a PhD in chemical engineering. She has completed her doctoral stage, in collaboration with Aarhus University from Denmark and her postdoctoral stage at McMaster University in Canada. During the research activity, she has gained experience in different domains: biomass transformation into valuable compounds, microwave assisted extraction of bioactive compounds from vegetable materials, process intensification using ultrasounds, environmental protection, organic synthesis. These activities were quantified by publishing over 30 ISI articles, by participating at over 50 conferences.

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The influence of biological nitrogen and organic fertilizers on crop productivity in arable land under organic farming conditions

Organic farming systems have advantages in terms of environmental impact, but often result in lower crop yields and profits compared to conventional production. The purpose of the research is to assess the impact of various methods of sowing and utilization of legumes and granulated cattle manure, and their combinations on the productivity of rotation sequences and the flows of productive and non-productive organic matter. It is worth paying more attention to plant productivity in arable organic farming. Higher plant yields mean more plant residues. Plant residues can be increased by using commercial fertilizers or locally sourced forage legume undersown. Studies have shown that RC (sowing year) ground mass applied as a fertilizer in combination with cereal (main crop) straw is qualitatively comparable to Granulated Cattle Manure (GCM). However, the two differ in terms of decomposition intensity and impact on cereal yield. The mass of forage legume undersown and the amount of N accumulated in it are difficult to predict and depend on meteorological conditions and cultivation agrotechniques. The effect of nitrogenous clover mass on crop yields is short-lived, unlike that of GCM. It has been found that, in a three-year rotation, less than half of the organic matter accumulated in the crop is returned to the soil when only the straw of cereals is used as a fertiliser. In the three-year cereal chain, two different improvement means increased the amount of organic matter incorporated by a factor of two or more compared to the plot where no additional improvement means had been applied. The study has shown that plant yield and soil organic carbon were positively influenced by the use of two different means, i.e. the cultivation of forage legume undersown and the application of commercial fertiliser (GCM). These measures can replace RC cultivation in the main crop (green fallow) and also reduce the loss of marketable production. Weather conditions often play a decisive role in the productivity of the main crop and intercrop systems, the extent of mineralisation of biomass incorporated in the soil, the timing of nitrogen supply and uptake.

Audience Take Away Notes

- The research data provides knowledge about the crop's productivity in arable organic agriculture, the flow of productive and non-productive organic matter, the balance and how to control it. A comparison of organic fertilizers and legume swards biomass used for green manure is presented. It is a practical solution that helps to stabilize the yield of plant problems, maintaining adequate productivity in arable organic farming

Biography

Dr. A. Arlauskienė studied Agronomy at the Lithuanian Academy of Agriculture. She received her PhD degree in 2000 at the Lithuanian Institute of Agriculture. Her research fields are legumes crops and plant diversity, green manure and plant mass decomposition regularities as well as organic farming systems. The researcher is a participant in more than 20 National Science Programs and EU General Programs and other international scientific projects. She has published more than 70 research articles in journals indexed in Clarivate Analytics Web of Science database and other peer-reviewed journals.

Danijela Ristić[1*], Snežana Gošić Dondo[2], Jelena Vukadinović[1], Natalija Kravić[3], Marija Kostadinović[1]

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Changes in the free phenolic acids content in maize kernels after the different crop protection strategies for European corn borer attack

After wheat and rice, maize is one of the most economically important cereal grains. It is exposed to various weather conditions, which can affect the occurrence and intensity of Ostrinia nubilalis Hübn infestation. O. nubilalis larvae feeding on maize can lead to mechanical damage to the aboveground parts of the plant, disrupting the transport of nutrients and water. Additionally, phenolic acids are known for their various nutritional and antioxidant activities and are constitutive antimicrobial compounds of plants. The main goal of this research is to investigate the relationship between changes in free phenolic acid levels following pesticide treatments in the maize kernels of three different maize hybrids. The experiment involved seven treatments (two seed treatments and four foliar treatments) and an untreated control, with three repetitions. Free phenolic acids (protocatechuic, vanillic, p-coumaric, and ferulic) were analyzed using High-Performance Liquid Chromatography (HPLC) with a photodiode Array Detector (DAD). The HPLC analysis showed that ferulic and p-coumaric acids were the dominant compounds in the analyzed samples. The effect of one seed pesticide treatment application was reflected in an increase in all analyzed phenolic acids in one hybrid. Pesticide treatments mainly caused a reduction in phenolic acid content. However, the increase of some phenolic acids content under different pesticide treatments may indicated the advantages and disadvantages of different treatments, which might be useful in maize crop protection strategies.

Audience Take Away Notes

- The methodology can be applied to analyzed other species
- Safe crop protection strategies for pest control are an essential factor for future agriculture
- The results presented can be the starting point for other phytochemical alterations after pesticide treatments

Biography

Danijela Ristić is a senior research associate in the Laboratory for Molecular Genetics and Physiology of Maize Research Institute Zemun Polje. She graduated at the University of Belgrade in the Faculty of Biology and obtained a PhD in Genetics in the same Faculty. The main research area involved the molecular makers application in plant breeding, as well as examination of the nutritional quality, bioactive compounds and antioxidant activity in maize.

Geraldo Rossoni Sisquini[1*], Diolina Moura Silva[1], Patrícia Bourguignon Soares[2], Kamila Ghelardi Baião[3], Eliane Meire De Souza Araújo[3], Weverton Pereira De Medeiros[1], Vinicius Henriques Carvalho[3], Leonardo Faria-Silva[3]

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Data collection to carry out strategic analysis of production chains in Northeast Brazil

The Ministry of Agriculture and Livestock (MAPA) works with different Strategic Initiatives that support the execution of the 2020-2031 Strategic Plan, among which the Action Plan for the Northeast stands out. The second stage, called Northeast + Sustainable, was established in MAPA by Ordinance 577, of April 6, 2023 and brought guidelines to achieve lasting social and environmental benefits, with economic viability, seeking to support sustainable development in agriculture in these regions, through the complementarity and synergy of actions between MAPA, its linked entity and partner institutions of the plan. Therefore, in addition to local representations of MAPA and linked institutions, the actions bring together public and private partner institutions, seeking to strengthen the effectiveness of local and institutional productive arrangements. Northeast + Sustainable actions are made possible through the prior preparation of Productive Diagnostic Plans (PDPs): instruments of economic and social recovery for each Territory, which, as they involve the implementation at the level of production chain activities, are also related to various sectors of the economy, generating a multiplier effect on all other sectors associated with these chains. Considering the need to collect primary data that provides detailed information on the production processes of different sectors involved in the priority production chains within each Territory of the Northeast + Sustainable Program, such as rural producers, associations, industries and traders, the planning of field activities in this context was made possible through a research project previously approved by the Research Ethics Committee (CEP) of the Federal University of Espírito Santo (UFES), under opinion No. 6,084,590. In this way, the project provided the creation of questionnaires for a local diagnosis, with primary information that will contribute to the composition of Reference Framework II of the Productive Diagnostic Plan (PDP). Therefore, data was collected through personalized questionnaires for each production chain and sector, which were prepared and applied by the Technology and Innovation Center of the Espírito-Santense Technology Foundation (NTI/FEST). The results collected through the questionnaires prepared will present the characterization of the production chains prioritized in each Territory and their flow of activities within a context, based on the collection of data and primary information regarding the conditions of production, transformation, distribution and commercialization. The investigation of regional economic characteristics, when it comes to the territories prioritized in the Northeast+Sustainable, lacks details that cannot be captured through the demographic, agricultural census and other sources of aggregated data, as this is sensitive information. Based on the need to capture the heterogeneity of productive services in a given sector, the empirical efforts of this Reference Framework will be carried out. In other words, in the process of identifying producer agents and other participants in the value creation process of the production chain, different technological conditions, production possibility curves, allocative distribution of resources and behaviors in terms of preferences will be found. Assessment of the competitive environment of agents directly inserted in priority production chains will determine the most appropriate techniques for the predominant production profile in the region and the sector's development potential.

Audience Take Away Notes

- **Understanding Data Collection Methods:** You'll detail various data collection methods suitable for analyzing production chains, such as surveys, interviews, and data mining from existing databases
- **Data Relevance and Quality:** Highlight the importance of gathering relevant data and ensuring its quality to derive meaningful insights. This includes discussing techniques for verifying data accuracy and completeness
- **Identifying Key Metrics:** Teach the audience how to identify and prioritize key performance indicators (KPIs) within production chains. This involves understanding the specific dynamics and nuances of Northeast Brazil's industries
- **Utilizing Technology:** Introduce modern tools and technologies for data collection and analysis, such as data analytics software, IoT sensors, and remote sensing technologies. Explain how these tools can streamline the data collection process and improve accuracy
- **Interpreting Data Trends:** Guide the audience on how to interpret data trends within production chains, including understanding seasonality, market fluctuations, and socio-economic factors unique to the region
- **Strategic Decision-Making:** Demonstrate how data analysis can inform strategic decision-making within production chains. This includes identifying opportunities for optimization, cost reduction, and market expansion
- **Case Studies and Examples:** Provide real-world case studies and examples relevant to Northeast Brazil's production chains. These practical illustrations will help reinforce key concepts and demonstrate the effectiveness of data-driven strategies

Biography

Geraldo Rossoni Sisquini, Ph.D. in Naval and Oceanic Engineering, with an emphasis on Structural Reliability and Integrity. He is the Administrative Director, and Financial Director. he has the General Treasurer of ADUFES for two terms. He was the Director of the Technological Center of UFES from 2013 to 2021, Member of the State Council of Public Works (CEOP), He also served as the Coordinator of the CT-Junior Extension Project, Coordinator of the Distance Education Working Group (GT-EAD) of CREA-ES, President of the Board of Directors of the Espírito Santo Foundation of Technology (FEST) from 2013 to 2016 and from 2020 to 2024. He is the Director of the Administrative Council of the Capixaba Center for Metal-Mechanical Development (CDMEC).

Geraldo Rossoni Sisquini[1*], Diolina Moura Silva[1], Patrícia Bourguignon Soares[2], Kamila Ghelardi Baião[3], Eliane Meire De Souza Araújo[3], Weverton Pereira De Medeiros[1], Vinicius Henriques Carvalho[3], Leonardo Faria-Silva[3]

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Environmental management platform for rural properties in Brazil as an instrument to combat deforestation and reduce greenhouse gas emissions

In order to promote the management of environmental information for rural properties declared in Brazil's Rural Environmental Registry (Cadastro Ambiental Rural, CAR), the Rural Environmental Registry System (SICAR) was established. SICAR serves as a data storage platform where all CAR information in the country is recorded. CAR functions as a database for environmental and economic control, monitoring, planning, as well as combating deforestation across the entire national territory. Institutionalized by Law No. 12,651 on May 25, 2012, and regulated by Decree No. 7,830 on October 17, 2012, along with Normative Instructions No. 02 on May 6, 2014, and No. 3 on December 18, 2014, from the Ministry of the Environment and Climate Change (MMA), the Rural Environmental Registry (CAR) is a fundamental instrument for collecting and unifying information related to rural properties in Brazil. Considering Brazil's international commitment to reduce its greenhouse gas emissions by 50% and achieve zero deforestation by 2030, this work discusses the challenges of this process and how the technological platform of SICAR can contribute to achieving these goals. Additionally, it provides decision support tools for landowners and policymakers, enabling them to make informed decisions about land management practices. This includes identifying sustainable land use practices, such as agroforestry systems or reforestation initiatives, to mitigate deforestation and reduce emissions. The platform also facilitates compliance monitoring with environmental regulations and land use policies by tracking changes in land use against established legal frameworks. Moreover, it engages stakeholders such as landowners, government agencies, NGOs, and local communities in environmental monitoring and management efforts, promoting transparency and accountability in land use decision-making. It can also support certification programs and incentive schemes aimed at promoting sustainable land management practices by providing transparent and verifiable data on land use and environmental performance. Furthermore, it integrates climate change mitigation strategies into land management planning, such as carbon offset projects, forest conservation agreements, and payments for ecosystem services schemes. Overall, an environmental management platform for rural properties in Brazil is a multifaceted tool for addressing deforestation and reducing greenhouse gas emissions, combining data-driven monitoring, decision support, stakeholder engagement, and policy implementation to promote sustainable land use practices and environmental conservation.

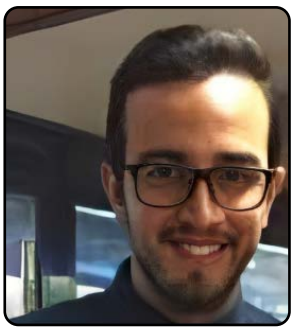
Audience Take Away Notes

- **Understanding the Importance:** They will grasp the significance of implementing environmental management platforms in rural areas of Brazil to address pressing issues like deforestation and greenhouse gas emissions

- **Functionality of the Platform:** They will gain insight into how the platform operates, including its use of satellite imagery, GPS data, and land use mapping techniques to monitor changes in land use and detect instances of deforestation
- **Decision Support Tools:** The audience will learn about the decision support tools embedded within the platform, empowering landowners and policymakers to make informed decisions regarding sustainable land management practices
- **Compliance Monitoring:** They will understand how the platform aids in compliance monitoring with environmental regulations and land use policies, helping to ensure adherence to legal frameworks and combat illegal land conversion
- **Stakeholder Engagement:** The presentation will highlight the importance of engaging stakeholders, such as landowners, government agencies, NGOs, and local communities, in environmental monitoring and management efforts facilitated by the platform
- **Transparency and Accountability:** Attendees will learn how the platform promotes transparency and accountability in land use decision-making by making environmental data accessible to the public

Biography

Geraldo Rossoni Sisquini, Ph.D. in Naval and Oceanic Engineering, with an emphasis on Structural Reliability and Integrity. He is the Administrative Director, and Financial Director. he has the General Treasurer of ADUFES for two terms. He was the Director of the Technological Center of UFES from 2013 to 2021, Member of the State Council of Public Works (CEOP), He also served as the Coordinator of the CT-Junior Extension Project, Coordinator of the Distance Education Working Group (GT-EAD) of CREA-ES, President of the Board of Directors of the Espírito Santo Foundation of Technology (FEST) from 2013 to 2016 and from 2020 to 2024. He is the Director of the Administrative Council of the Capixaba Center for Metal-Mechanical Development (CDMEC).



Gustavo J. Cáceres-Cevallos[1*], María Quílez[2], Cristina Martínez-Conesa[1], Pascual Romero-Espinar[1], Inmaculada García-Aledo[1], Leandro Olivares-Quílez[1], María J. Jordán[1]

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Drought response of *Thymus zygis ssp. gracilis* pre-exposed to high-intensity light pre-treatment

Global concern regarding climate change is prompting the development of strategies to enhance the resistance of plants to abiotic stresses. Drought is one of the main threats to the productivity of rainfed crops, among them, the important aromatic and medicinal plant Thymus zygis ssp. gracilis. Plants under stressful conditions may generate a "memory" that allows them to cope with stress more effectively in the future. Thus, this study aimed to determine whether the pre-treatment of thyme with high-intensity Light-Emitting Diode (LED) light (light priming) could enhance its physiological response and activation of its antioxidant defense system to subsequent severe drought. To that end, physiological parameters including relative water content, proline and abscisic acid levels, photosynthetic pigment and tocochromanol content, phenolic profiles, antioxidant capacity, and lipid peroxidation were quantified using 1600 clones from 20 ecotypes. Results confirmed the positive effect of light priming, this treatment improving the antioxidant system response in around 70% of the red thyme ecotypes studied. Specifically, light priming was associated with a smaller reduction in the content of photosynthetic pigments and tocochromanols, higher caffeic acid dimethyl ether content, and reduced lipid peroxidation in response to drought. In conclusion, light priming may generate a "memory" that helps thyme cope better with subsequent oxidative stress.

Audience Take Away Notes

- LED light priming is a cost-effective way to enhance the quality of crops, and specifically, our research indicates that this tool could be used to obtain drought-resistant varieties
- Since LED light technology is easy to handle and widely accessible, it could be a useful additional tool for the development of several crops, especially for harnessing plants' valuable intrinsic characteristics
- Other benefits:
    - Aromatic and medicinal plants are important crops globally, owing to their usefulness and economic value
    - *Thymus zygis* is one such species that has numerous applications in a variety of fields from the cosmetics and perfume industries to medicine
    - Our research has focused on improving this species' drought tolerance, and we have achieved significant progress using LED light priming

Biography

Dr. Gustavo Cáceres-Cevallos studied biotechnology at the Armed Forces University (ESPE), Ecuador. After completing his M.Sc. in Environmental Agrobiology at the University of Barcelona, he joined Dr. Jordán's research group on Rainfed Agriculture for Rural Development at the Murcia Institute of Agri-Food and Environmental Research (IMIDA), Spain. In 2023, he received his Ph.D. in Food Technology, Nutrition, and Bromatology from the University of Murcia for research on the selection of drought-resistant aromatic and medicinal plant varieties. Currently, he is investigating the use of LED light to enhance the production of bioactive compounds, and how this may help obtain drought-resistant varieties.

Hamil Uribe*, Jorge Retamal, Marisol Reyes, Cristian Arancibia
Department of Natural Resources, Instituto de Investigaciones Agropecuarias, INIA Quilamapu, Chillán, Ñuble, Chile

Effect of different levels of irrigation on yield and yield components of hazelnut (*Corylus avellana*) in central Chile

Hazelnut is rapidly expanding in Chile, particularly in central zone, where the climate change has significantly diminished water availability, making irrigation vital. This study assesses hazelnut responses to different irrigation levels, focusing on yield and quality. The trials examined the response of adult plants of cultivar 'Tonda di Giffoni' to different levels of irrigation over the years 2021 to 2023, in the villages of Ñiquén and "El Carmen" in the region of Ñuble, Chile. The research evaluated four irrigation treatments in farmers' orchards: T_1=125%, T_2=100%, T_3=75% and T_4=50% irrigation, using a randomized complete block design with five replications, 100% being the farmer's irrigation. The applied water was converted to percentage in relation to the ETc, obtained from ETo and Kc.

Additional drip lines, paralleling to the existing irrigation systems, made possible differentiated irrigation treatments, while homogenous fertigation was applied in all treatments, via the original system. Yield and yield component assessments, alongside xylem potential, stomatal conductance, and soil moisture measurement, were conducted.

Yield was positively affected by irrigation in the second year, while in the first year there was not significant differences. At El Carmen, total yield showed a positive trend with increased irrigation, but there were no significant differences. The percentage of empty and defected nuts were significantly higher in T2 and T3. Additionally, a significantly higher husk percentage was observed in T3.At Ñiquen, the total yield showed a positive trend with increased irrigation, being significantly lower in T4. The percentage of empty and defected nuts was low and does not show significant differences. The percentage of husk increased with reduced irrigation, being significantly higher in T3. It is concluded that irrigation positively affects hazelnut yield and quality, although there may be local factors in the orchards that affect this trend.

Audience Take Away Notes

- The audience will be able to improve the irrigation strategies in hazelnut
- The audience will be able to apply the results and method used in this work in:

1. Irrigation scheduling,
2. Solutions of problems in orchards
3. Design of experiment in effect of irrigation on crops

4. Understand parameter affected for different irrigation levels in hazelnut, also in other crops

Biography

Dr. Hamil Uribe studied agricultural engineering at University of Concepción, Chili and graduated as MS in 2003 and as Dr. in 2009. He joined the water research group of the Instituto de investigaciones agropecuarias, INIA-Chile. He is a researcher in water managements and had worked in Florida State University, in Gainesville, Florida, USA and University of Hohenheim, Stuttgart, Germany. He has published research articles and technological diffusion in irrigation and hydrology.

Ioana Popa*, Ana-Maria Drăghici-Popa, Adina Ionuța Gavrilă, Cristian Aurelian Boscornea

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Combined microwave and ultrasound technique as an efficient extraction method of bioactive compounds from flaxseed

The pursuit of environmentally sustainable practices has driven research into green extraction methods for bioactive compounds from plants. This study presents the combined application of microwave and ultrasound techniques to enhance polyphenol content and Antioxidant Activity (AA). Flaxseeds underwent microwave pretreatment before being subjected to ultrasound assisted extraction of polyphenolic compounds. Comparative experiments using separate techniques and a conventional method were performed. The influence of different parameters including extraction time, temperature, and ethanol concentration in water on the Total Phenolic Content (TPC) and AA was studied. Data showed a significant increase ($p<0.05$) in TPC and AA with 80% ethanol concentration compared with 50% and 96%. The highest TPC and AA were obtained after 15 min of extraction. Prolonged extraction time led to a slight degradation of polyphenols. ANOVA analysis indicated that the TPC and AA increase significantly with increasing the temperature from 30 to 45°C ($p<0.05$) and non-significantly from 45 to 60°C ($p>0.05$). The combined use of microwave and ultrasound resulted in higher yields compared with conventional extraction (a 60% increase) or the use of ultrasound (a 24% increase) or microwave (a 30% increase) separately. Moreover, this approach is a more eco-friendly and highly effective technique compared with conventional methods. The resulting extracts, enriched in polyphenols, could potentially find applications in various fields such as pharmaceutical, food, agriculture, etc. as alternative source of antioxidants.

This work was supported by a grant from the National Program for Research of the National Association of Technical Universities-GNAC ARUT 2023.

Audience Take Away Notes

- This research highlights the growing awareness and importance of sustainability in various industries, including the extraction of bioactive compounds from plants, by using advanced technologies which focus on intensification, such as effective energy use, increased mass transfer, reduced equipment size etc
- The study underscores the effectiveness of synergistic approaches (the combined use of microwave and ultrasound techniques) in enhancing the extraction efficiency of bioactive compounds from plants. This strategy can be applied to various bioactive compounds and diverse plant materials
- Through the utilization of an eco-friendly solvent, the resulting extracts, enriched in polyphenols, hold potential commercial value across various industries

Biography

Dr. Popa received her PhD degree in 2018 from the Faculty of Applied Chemistry and Materials Science at the University Politehnica of Bucharest. Following her doctoral studies, she assumed the position of Assistant Professor at the same University, where she currently holds the position of lecturer. Dr. Popa has published more than 18 ISI research articles, with 9 of them Q1/Q2, and was the main author on 12 of them. She has 3 patent applications. Dr. Popa was part of the research team for 9 national projects (one of which as project director) and 1 European project.

James A Grant-Jacob*, Michalis N Zervas[1] and Ben Mills
Optoelectronics Research Centre, University of Southampton, SO17 1BJ, UK

Playing with pollen grain structure using latent space

Pollen grains have evolved over time, shaped by environmental and ecological factors. These grains come in a variety of sizes and have nano-scale structures. Their morphology, which can take forms such as trilobal, spherical, or hexagonal, and have a variety of surface features like apertures, are vital for processes like germination. The surface of pollen grains can possess unique features such as spikes that enable them to adhere to various modes of transport, such as bee legs, bird feathers or animal fur, and help them navigate through the air on appendages that look like airplane wings or balloons. Their structure offers insights into plant adaptive strategies and assists in species identification. In addition, morphological changes in pollen grains can occur due to dehydration, while climatic conditions over time can facilitate evolutionary morphological changes in a species. Therefore, pollen grain imaging is a critical technique as it provides 2D and 3D morphological information, offering key insights into pollen evolution, and even the health of crops and the environment. However, modelling and understanding the structure of pollen grains using analytical methods can be laborious and challenging. Advances in Graphics Processing Units (GPUs) and deep learning algorithms have facilitated large-scale, data-driven research. Convolutional Neural Networks (CNNs) have been deployed across palynology, automating pollen identification, and contributing to fields like agriculture, botany, and climate science. The Style Generative Adversarial Network (StyleGAN), a type of generative neural network, creates and modifies synthetic images, controlling specific aspects through the manipulation of the latent space. In palynology, StyleGAN can be used to generate synthetic images of pollen grains, allowing for the exploration of characteristics such as size and shape. This could potentially unlock further understanding of palynological relationships from an evolutionary perspective. This paper employs deep learning, specifically style transfer, to investigate the latent 'w-space' of pollen grain microscope images, generating synthetic images. This could enhance our ability to analyse a variety of pollen types, broadening our understanding of plant evolution and ecology.

Audience Take Away Notes

- The application of deep learning, specifically StyleGAN, in generating synthetic images of pollen grains
- The potential of deep learning in automating pollen identification and contributing to fields like agriculture, botany, and climate science
- The potential of exploring characteristics such as size and shape in generated images to unlock further understanding of palynological relationships
- Understand the potential of deep learning in the field of palynology
- Apply similar techniques in their research or work, especially if they are involved in fields like

agriculture, botany, and climate science
- Explore the use of StyleGAN in other areas of research
- Providing them with a new perspective on how to apply deep learning in their field of work
- Offering a practical solution to automate the process of pollen identification, which could simplify their job if they are involved in related fields
- Providing new information that could assist in design problems, especially in the design of experiments or studies involving pollen grains
- Incorporating the techniques presented in this research into their curriculum
- Using the findings of this research as a basis for further studies in the field of palynology or deep learning
- Potentially unlocking further understanding of palynological relationships from an evolutionary perspective
- Enhancing our capacity to analyse a variety of pollen types

Biography

Dr. James A Grant-Jacob is a Senior Research Fellow at the Optoelectronics Research Centre, University of Southampton, who has a diverse research portfolio, including high harmonic generation, laser fabrication, DNA sequencing, imaging, and AI. He has over 170 publications, including collaborations with NASA on laser manufacturing for greenhouse gas detection. Utilizing NVIDIA grants, he's improved laser-based processes through deep learning. In 2019, he presented his AI-based particle pollution detection research at STEM for BRITAIN in the UK Houses of Parliament. He's collaborated with companies like Dyson and institutions like Southampton General Hospital.

Jimenes-Kobs E. B, Pineda-Pineda J, Lira N, García-Mateos M. del R, Magdaleno-Villar J. J*

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Alternative organic substrates in hydroponic tomato production

There is a wide variety of materials that can be suitable as growing substrates, considering their physical, chemical and biological characteristics. The proportion in the mixture of most inorganic and organic materials has an important role in obtaining a new one, because organic matter is an active component and its incorporation into the inorganic substrate can help improve its characteristics. The aim of this study was to determine the feasibility of using alternative organic substrates to conventional ones, in a mixture with low-cost inorganic substrates, on the agronomic components in the production of hydroponic tomato in the greenhouse. A randomized complete block experimental design was used with four replications and six treatments (S1: oat straw/tezontle 75/25 v/v, S2 oat straw/tezontle 50/50 v/v, S3 corn straw/tezontle 75/25 v/v, S4 corn straw/tezontle 50/50 v/v and S5 Coconut fiber and S6: tezontle (volcanic sand), as controls). The physical properties and water fractions of the substrates were evaluated before and after the cultivation cycle, morphological variables of the plants, yield and fruit quality. As results: the apparent density was affected by the proportion of the mixtures and this increased at the end of the cycle. Coconut fiber showed the greatest porosity, this property was also greater in the substrates mixed in a 75/25 v/v proportion. The mixed substrates and coconut fiber had high aeration capacity with low percentages of Easily Available Water, Reserve Water and Totally Available Water. At the end of the cycle, the mixed substrates improved due to the decomposition of organic matter, S6 remained stable. There were no differences in growth, yield and fruit quality. The substrates did not reach ideal physical characteristics, but they allowed a normal short cycle in tomato cultivation.

Keywords: Solanum Lycopersicum L, Crop Residues, Soilless Cultivation, Water Fractions.

Audience Take Away Notes

- How can we reduce production costs in greenhouse tomato cultivation, without affecting its performance?
- How substrates other than conventional ones can be used in hydroponic tomato production?
- What physical properties are modified with mixtures of organic and inorganic substrates?
- How the water fractions in a substrate are affected after its use in a crop?
- How the physical properties of substrates are altered after a production cycle and whether they can continue to be used?

Biography

Dr. J. Jesús Magdaleno Villar graduated from the Doctorate in Horticulture Sciences from the Autonomous University Chapingo (UACh) in 2006, he has published 14 scientific articles in various Horticulture journals, he is a professor-researcher at the UACh from 2014 to date, He has supervised 13 bachelor's, master's and doctoral theses. He has participated as an organizer and speaker of scientific events and field demonstrations from 1992 to date, he has been a field coordinator, research support coordinator and viceprincipal of research at the UACh in different periods.

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Universidad Autonoma Chapingo, Mexico

Morphological characterization of 47 accessions of calla lily (*Zantedeschia aethiopica (L.) Spreng*)

The morphological characterization of species has been used to know genetic diversity among accessions and represent significant information for the conservation of plant genetic resources as well as to support genetic improvement programs. The objective of this work was to characterize in situ 47 calla lily accessions grown in the provinces of Veracruz and Mexico, using the UPOV 2001 descriptive guide, through 19 quantitative and 20 qualitative characters on a nominal scale. By means of Principal Component Analysis (PCA), it was determined that the first five components of quantitative traits explained 79.46% of the observed variation while for qualitative traits the first five components explained 78.52% of the observed variation. The eigenvalues indicated that characters related to blade length and width, spathe height and length, petiole length and plant height contributed largely to the total diversity of the characterized germplasm. While qualitative characters related to spathe color, spadix and stems were the major contributors. Morphological markers detected genetic diversity among UBCs and were able to differentiate accessions by a clustering analysis represented in a dendrogram. The accessions were grouped into five and seven clusters or population patterns, according to quantitative and qualitative traits, differentiated mainly by the climatic conditions in which they thrive. The accessions of Z. aethiopica (L.) Spreng, originating from central-eastern Veracruz and Edo. de México analyzed in this study showed high morphological variability, which shows the germplasm potential and a beginning to establish strategies for a genetic improvement program.

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In-vitro micropropagation of a salinity tolerant clonal rootstock issued from interspecific cross between glycophyte *Solanum lycopersicum* and halophyte *Solanum chilense*

The purpose of this study is to obtain quality salinity tolerant interspecific clonal rootstocks (JUPAFOR-1) through in vitro micropropagation to be grafted on tomatoes. This study is aimed at finding the optimal combinations and concentrations of growth regulators for the micropropagation of a salinity-tolerant rootstock created at INIA from a cross between Solanum lycopersicum and S. chilense. The trial was conducted at the Laboratory of Physiology and Biology and Molecular (LFBM) of INIA-Rayentué, O'Higgins Region. The hypothesis postulates that the use of growth regulators in vitro micropropagation improves the quality of clonal rootstock seedlings and optimizes the grafting process in tomatoes. A rootstock was micro propagated, using a culture medium with different regulator contents: the control treatment (without growth regulator), Indole-3-Butyric Acid (IBA), 1-Naphthaleneacetic Acid (ANA), the combination of both in the same concentration (IBA+ANA) and the control treatment (control), which was the Murashige-Skoog (MS) culture medium without hormones. Contamination, mortality, and vigour (aerial and root growth) were evaluated. The IBA treatment resulted in better quality in vitro seedlings, with better root and aerial growth compared to the other treatments. Therefore, from this work, quality salinity-tolerant clonal seedlings were obtained for grafting tomatoes sensitive to saline stress.

Audience Take Away Notes

- It can be used for researchers working in in-vitro culture
- Make better use of growth regulators for in vitro production
- This research could be used by other faculty to expand their own research or teaching
- This provides a practical solution to a problem that could simplify or make a designer's job more efficient
- Benefits to the plant procurement industry in obtaining quality vitro plant

Biography

Dr. Juan Pablo Martínez studied Agronomy at the University of Chile, Chile an. He then joined the research group Plant Physiology of Prof. Stanley Lutts at the University Catholic of Louvain, at Louvain-a-Neuve, Belgium. He received her PhD degree in 2001 at the same institution. After two years postdoctoral fellowship supervised by Dr. Manuel Pinto at the Plant Physiology Laboratory in University of Chile, Chile. He obtained the position of a full researcher at the Agricultural Research Institute (INIA-Chile) in 2005. He has published more than 40 research articles in SCI(E) journals.).

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Efficient micropropagation system in fruits and woody plants

Micropropagation has the advantage of being able to obtain a large number of pathogen-free seedlings in a short period of time and of being able to reproduce all year round regardless of the season. The apple (Malus×Domestica Borkh, Rosaceae) is one of the fruit crops propagated through micropropagation. In Korea, dwarf rootstock varieties such as M.26 are known to be suitable for the cultivation environment and are mainly produced and supplied through micropropagation. In the case of birch trees, cuttings are difficult, so a micropropagation system is used. These are all high value-added varieties and have the advantage of generating large profits through micropropagation through tissue culture. However, contamination frequently occurs during tissue culture due to symbiotic or parasitic endophytes inside the plant and fungal spores or bacteria invading from outside.

In this study, we aim to establish an efficient micropropagation system in fruits and woody plants through PDS treatment to block infection cases occurring in tissue culture and minimize culture loss.

Biography

Juhan Park after receiving his Associate Degree of horticulture from Yonam college, He transferred to Konkuk University, where he has a double major in life sciences and forest science. He joined to plant tissue culture start-up 'PhytoResearch' as co-founder. Juhan Park is the R&D Director at Phytoresearch Co., Ltd. He holds an Associate Degree in Horticulture from Yonam College and an undergraduate degree in Forestry and Life Science from Konkuk University.

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Identification of salt responsive proteins in rice leaf sheath (*Oryza sativa* L.) With nanoliquid chromatography-tandem mass spectrometry

To display the comparative proteomic profile of two rice leaf sheaths under salt stress, seeds of Thai moderately salt tolerant rice (Leaung Anan, LA) and high salt tolerant rice (Pokkali, PX) were grown in hydroponic culture for 21 days before NaCl was introduced initially at the level of 12 dS m-1 for 10 days. Then the leaf sheath proteomes were analyzed by 1D-SDS-PAGE and NanoLC-MS/MS. In this study 873 proteins were detected. Among of these proteins, 219 proteins were known proteins and the other proteins were unnamed and unknown proteins. By using Mev software, we found that only 31 proteins in treated plants of both rice cultivars significantly expressed. Interestingly, we found that both rice cultivars have differing expressed proteins pattern such as putative sodium symporter protein was up-regulated more than 5 times in PX but down-regulated in LA and protein kinase was up-regulated more than 5 times in LA but down-regulated in PX.

Keywords: Mass Spectrometry, Proteomics, Rice Leaf Sheaths, Salt Stress.

Audience Take Away Notes

- As a result of my presentation, the audience will be known the up-regulated proteins more expressed may be play an important role to help them to survival under salt stress
- The audience will be able to use 1D-SDS-PAGE and NanoLC-MS/MS techniques to analyzed leaf sheath proteomes
- This research could be used by other faculty to expand their own research or teaching
- This provides a practical solution to a problem that could simplify or make a designer's job more efficient
- It will improve the accuracy of a design, or provide new information to assist in a design problem

Biography

Dr. Kanlaya Kongngern is an Assistant Professor and he is working in Khon Kaen University since 1997. His teaching and research are in plant stress physiology. His research aims to determine some proteins that were up-regulated and may be play an important role to help plants to survival under salt stress. His research aims to improve rice aroma level by using foliar spraying with stress stimulants and to improve quality of produce of economic crops by using such as H_2O_2. So far, there are more than 15 graduates finish from me had gone on to work in this field.

Londiwe Mabuza[1, 2*,] Dirk Swanevelder[1,] Bridget Crampton[2]

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Targeted modification of the $CENH_3$ gene in sunflower using a tomato yellow leaf CURL (IL-60-BS) viral vector system for the delivery of CRISPR/CAS_9 components

Doubled haploid (DH) technology could fast-track the production of elite inbred lines as DH lines contain completely homozygous genomes. However, the reliance of DH production methods on in vitro culture has resulted in the lack of a dependable DH production technique for sunflower. The identification of the centromere-specific histone 3 (CenH3) gene as a key player in chromosome segregation has been a breakthrough in eukaryotic haploid induction (HI) technology. In this study, we identified amino acids in the sunflower CenH3 gene that were previously associated with haploid induction in Arabidopsis thaliana. A virusbased delivery system for genome editing in sunflower was tested, with plants mechanically inoculated with a deactivated tomato yellow leaf curl virus (TYLCV) harbouring the Cas9 endonuclease, guide RNA and a sunflower CenH3-based donor "repair template". PCR amplification of transformed sunflower cDNA confirmed Cas9 transcription in T0, T1 and T2 generations, indicating that the vector is actively expressing components, semi-persistently, and is seed transmissible. Two of the ten inoculated T0 plants contained mutations in the target area: One plant displayed some cells with full homology- directed repair (HDR) converting three amino acids (P51S, G52E, and A55V), while the other displayed partial HDR with only two amino acid conversions (P51S and A55V).This study demonstrates the upper limit of loading capacity of a geminiviral vector to be almost 8kb, while maintaining cell-to-cell movement and gene expression of the CRISPR components leading to successful gene editing in sunflower. This study provides a steppingstone in genome editing and potential trait improvement in sunflower.

Audience Take Away Notes

- Genome editing is yet to be routine, the audience will learn a new technique for delivery of genomic material to tissue culture recalcitrant crops such as sunflower
- Efficient use and adoption of genome editing technologies
- Yes, genome editing using a simple to design and deliver viral vector

Biography

Dr Londiwe Mabuza is an early career Scientist who recently graduated from the University of Pretoria with a PhD in Biotechnology. Dr Mabuza's research focus is on genome editing of crop plants for plant breeding improvement. She was previously employed by the Agricultural Research Council – Biotechnology Platform as a research technician. Dr Mabuza is currently employed by the National Research Foundation – SAEON as a specialist for research and planning.

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Performance of sugarcane seedlings infected with fusarium and treated with the entomopathogen *Metarhizium anisopliae*

The stem rot need attention due to the losses that may occur in the industry due it be the diseases that limit the quality of sugarcane production. Commonly, management is done through fungicide applications, however, the use of antagonistic microrganisms is an alternative control method and does not cause contamination in the environment or for the applicator. Metarhizium anisopliae, a microbial agent of extreme importance in pest control, has shown a potential inhibitory effect on Fusarium spp, the pathogen that causes rot. The objective was to evaluate the effect of M. anisopliae on the initial growth of sugarcane with Fusarium spp. interaction. Gems of stalks healthy sugarcane variety RB867515 were washed and subjected to superficial disinfestation in sodium hypochlorite solution followed by 70% alcohol. They were then suspended at 1x105 spores/ml of Fusarium for 30 minutes and planted in pots containing soil infested with a suspension of 1x107 spores/ml of Metarhizium. Where the following treatments were carried out without applying Metarhizium and Fusarium (T_0); application of Metarhizium (T_1); application of Metarhizium and Fusarium (T_2); and application of Fusarium (T_3). A DIC was used, with four treatments and five replications. The height, thickness and number of leaves were evaluated at intervals of 21, 42 and 62 days. Subsequently, the fresh and dry weight of the aerial part and roots and root length were evaluated. Plants treated with Metarhizium (T_1) had the greatest height compared to plants inoculated with Fusarium (T_4). Plants treated with Metarhizium and Fusarium (T_2) had the greatest thickness up to 42 days, in addition to the greatest number of leaves, and the highest average fresh weight of the roots. The application of Metarhizium (T_1) resulted in higher fresh and dry weights of the aerial part of the plants. Given this, its potential use as a biocontroller, involving its beneficial action in the management of rot, can be applied preventively and will contribute to increasing phytopathogen control strategies, especially before the crop is implemented in the field.

Audience Take Away Notes

- Insights into how the use of the entomopathogen Metarhizium anisopliae can be used to promote growth in plants
- Furthermore, this microorganism can act to reduce the negative effects of phytopathogen Fusarium infection, an agent that causes rot in several crops of agricultural interest
- Sugarcane cultivation is widely practiced in Brazil and in several regions of the world
- This crop is extremely important, due to its capacity to produce sugar, ethanol, which is a clean and renewable energy source and currently most required in the energy transition
- The use of Metarhizium in the production of pre-sprouted sugarcane seedlings can result in greater efficiency in obtaining seedling vigor in the initial stage of development, representing an important

prerequisite potentially favorable to the implementation of new sugarcane plantations

- This research offers a basis for other researchers in the areas of Agronomy, Biology, Forestry Engineering, Horticulture, Fruit Culture, Phytopathology, Entomology who want to expand their studies in biological control of plant diseases or induction of growth in plants with the use of entomopathogens

Biography

Dr. Márcia has a degree in Agricultural Engineering, and a Master's and PhD in Agronomy (Plant Protection). She was a Scientific Development Fellow. She is currently Associate Professor IV at the Federal University of Paraíba, in the Department of Sugar and Alcohol Technology at the Technology Center and Regional Development, working with the diagnosis of sugarcane diseases, alternative methods of disease control, biological control of diseases, and training of farmers in Paraíba on the correct use of pesticides and return of packaging.

Gustavo J. Cáceres-Cevallos[1], Cristina Martínez-Conesa[1], María Quílez[2], Pascual Romero-Espinar[1], Inmaculada García-Aledo[1], Leandro Olivares-Quílez[1], María J. Jordán[1*]

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Seasonal variation and watering level effect on *Lavandula latifolia medik.* Essential oil yield and quality

Lavandula latifolia is one of the main aromatic and medicinal plant crops in Spain. Traditionally, the flowering tops of these plants are used for the extraction of essential oils, but to date, the optimal phenological stage for obtaining the maximum yield and quality has yet to be identified. Further, L. latifolia is a rainfed crop, and the scarcity of water resources in the Mediterranean region is having a marked impact on many such crops, implying a significant threat to their survival. The main goals of this study were to explore the combination of these two factors, namely, the optimum stage of harvest and the potential effect of reductions in irrigation on the productivity of these shrubs. For this, selected plants were cloned to establish an experimental crop under three different irrigation levels corresponding to the replacement of potential evapotranspiration in the area (ETo: 0%; 20% and 40%). To monitor seasonal variations in essential oil yield and composition, shrubs were harvested at four different phenological stages of the plant growth cycle: Beginning of Bloom (BB); Full Bloom (FB); Full Bloom-Beginning of Fruit Maturation (FB-FM) and Advanced Fruit Maturation (AFM). After Clevenger distillation, the oils' volatile profile was determined by capillary gas chromatography–mass spectrometry analysis.

Seasonal variation in essential oil yield and quality showed that the best levels of production were obtained when L. latifolia was harvested at FB-FM, this stage providing the highest relative concentrations of linalool and eucalyptol. These are the components most responsible for the fresh fragrance characteristic of L. latifolia. Moreover, the concentration of camphor, a component related to a pungent fragrance, decreased at the same seasonal stage. Analyzing the effect of watering level at this phenological stage (FB-FM), results showed irrigation equivalent to 40% of ETo was associated with significantly higher essential oil yield and quality. Specifically, the relative concentration of linalool was higher, while that of eucalyptol was lower, and no significant differences were observed in the case of camphor, compared to the composition of the essential oil produced by the control group (0% ETo). To sum up, in the semiarid conditions of the southeast of Spain, the yield and quality of L. latifolia crops improve by irrigating at a rate equivalent to 40% ETo replacement and harvesting flowering tops between full bloom and the beginning of fruit maturation.

Audience Take Away Notes

- This study shows the importance of ascertaining both the optimum period for harvesting and how drought level may influence yield and quality of rainfed aromatic and medicinal plant crops, and

describes the methods used and results for a specific case, providing a basis for other researchers to explore these parameters for other crops

- The biological properties of essential oils are directly related to their composition. Thus, knowing that both factors studied -harvesting period and level of watering- can influence essential oil yield and quality, researchers will be able to optimize crop management depending on the intended use
- There is global concern that climate change, which is associated with increasing temperatures, will lead to more prolonged and severe drought episodes, and in turn, decreased growth and yield of commercial crops
- In this context, it is extremely important to know the minimal water requirements to maintain growth and optimal agronomical yields under likely future conditions and this study describes how to investigate these requirements and results for the case of essential oils from *L. latifolia*

Biography

María José Jordán is a research scientist with more than 20 years of experience working on selection, breeding and new applications in food technology of aromatic and medicinal plants. She is responsible for the coordination and consolidation of new lines of research within the Rainfed Agriculture for Rural Development research group at the Murcia Institute of Agri-Food and Environmental Research (IMIDA). Throughout her scientific career, she has published more than 90 scientific articles.

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Lipid phytonutrients of *Salvia lavandulifolia vahl.* seeds from across the Iberian Peninsula

Polyunsaturated Fatty Acids (PUFAs) are an essential component of a healthy diet and a growing number of studies show their positive effects as human health promoters, indicating the importance of their inclusion in modern Western diets. Among other attributes, omega-6 PUFAs favorably contribute to lipid metabolism by decreasing cholesterol levels and enhance the regenerative capacity of the skin. Chia, flax, sesame, evening primrose, borage, and grape seeds have been extensively investigated, but few studies have explored the phytonutrient content of Spanish sage seeds (Salvia lavandulifolia). Such data are needed to confirm their value and then promote their use, through consumption of either the whole seed or the extracted oil, potentially opening up new fields of use and adding value to this crop. In this context, this study characterized the lipid fraction of Spanish sage seeds collected from different parts of the Iberian Peninsula (Tuixent, Vertavillo, and Moratalla). Specifically, the study determined the lipid yield, qualitative and quantitative fatty acid profile (by gas chromatography/mass spectrometry), vitamin E content (by high-performance liquid chromatography with diode-array or fluorescence detection), and radical scavenging activity (by 2, 2-diphenyl-1-picrylhydrazyl assay).

The seeds had an average oil yield of 14 g/100 g dry weight and a fatty acid content of nearly 90%. The three populations studied had very similar fatty acid profiles, with few differences in fatty acid content by seed source. Linoleic acid (C18:2 □-6) was the dominant fatty acid quantified (60%), contrasting with alpha- linolenic acid (C18:3 □-3), which represented barely 1%, while oleic and palmitic acids comprised approximately 25 and 10% of the content, respectively. Further, the total tocochromanol content ranged between 0.07 and 0.1%; of this, 70-80% corresponded to □ and □ tocopherol, and 8% to □-tocopherol and □-tocopherol quinone. The tocotrienol fraction represented 8%, □ being the most abundant form, accounting for a mean of 4% of the content. Additionally, the seed oils showed a potent antioxidant activity. The low intraspecific variability observed allows the seeds of Salvia lavandulifolia Vahl. to be considered a new source of omega-6 PUFAs, and therefore, a nutraceutical and functional ingredient in various food matrices.

Audience Take Away Notes

- The results indicate a potential use of aromatic and medicinal plant seeds (specifically, those of Salvia lavandulifolia) as a new source of oils rich in bioactive components, including omega-6 PUFAs and vitamin E

- Knowing the potential use of these seeds as a source of nutraceuticals or functional food ingredients, they could extrapolate this information to crops of interest in their areas of research
- Other benefits:
    - Currently unexploited aromatic and medicinal plant seeds have shown potential as a new source of bioactive components with nutritional interest
    - The findings may open new avenues for rural development

Biography

Ms. María Quílez graduated in Food Technology from the UCAM Catholic University of Murcia (Spain) in 2017 and obtained her Master's degree in nutrition and food safety at the same university in 2018. She has extensive experience in the selection and food applications of aromatic and medicinal plants. Currently, she is a member of the Biotechnology Team at the IMIDA under the leadership of Dr. Abel Lozano. She has contributed to 20 scientific publications.

M. Quílez-Simón[1,2*], Antonio A. Lozano[1], G. Cáceres-Cevallos[2], C. Martínez-Conesa[2], P. Romero- Espinar[2], I. García-Aledo[2], Leandro Olivares-Quílez[2], M. J. Jordán-Bueso[2]

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Effect of distillation on the yield and polyunsaturated fatty acid content of *Lavandula latifolia* and *Salvia lavandulifolia Vahl.* seeds. A commitment to the revaluation of their productions

The European Union is strongly committed to achieving greater environmental, economic, and social sustainability in the agro-industrial sector. Therefore, it is essential to reduce waste generation, and if necessary, recycle waste from agri-food production by adopting circular economy models. Regarding this concern, the Region of Murcia (southeastern Spain) has large areas of Lavandula latifolia and Salvia lavandulifolia Vahl rainfed crops. These aromatic plants are usually harvested when the shrubs achieve the phenological stage of full bloom to the beginning of fruit maturation, and essential oils are extracted by distillation of the entire aerial part of the plants, including seeds. This agri-industry process generates a significant amount of waste.

Numerous studies have highlighted the abundance of bioactive compounds in the residue from the distillation of aromatic and medicinal plants, particularly in their leaves and flowers. Nonetheless, there is currently a lack of data on the presence of these bioactive components in seeds after the distillation process. Previous studies have described the seeds of both species as new sources of Polyunsaturated Fatty Acids (PUFAs), with an omega-3 and omega-6 lipid profile, respectively. These chemical characteristics make them candidates for use in the food (functional ingredients or nutraceuticals) or pharmaceutical industries.

In this context, the main objective of this study was to assess the possible effect of distillation on oil yields and fatty acid profiles of the seeds. To this end, fresh and distilled seeds were analysed considering oil yield through cold extraction and the quality of the fatty acid profile measured by gas chromatography-mass spectrometry after methylation, in accordance with ISO standard 12966-2:2017.

Distillation affected seed oil yield differently in each species under study. Specifically, L. latifolia showed a loss equivalent to 20% of the initial oil content while no differences were observed in yield between fresh and distilled seeds in the case of S. lavandulifolia. Regarding fatty acid profile, the L. latifolia oil was rich in omega-3 PUFAs, with quantitative differences between treatments. Specifically, distilled seeds had significantly higher oleic acid (18.3%) and lower linolenic acid (12.4%) content than fresh seeds, while there were no significant differences in the other fatty acids analysed. In contrast, in S. lavandulifolia oil, omega- 6 PUFAs were the dominant fatty acid type. Further, the distillation process showed a negative effect on the fatty acid profile, with losses of up to 19% in oil content detected in all the components identified.

Nonetheless, these results demonstrate that it is still possible to recover oils from distillation residues and suggest that it would be feasible to implement new protocols in the industrial processing of L. latifolia and S. lavandulifolia crops, to comply with the principles of waste prevention and resource recovery in the EU's sustainability policies.

Audience Take Away Notes

- The results indicate the possibility of using Spanish sage and spike lavender seeds as a new source of oils rich in bioactive components, including omega-6 and omega-3 PUFAs and hence, provide the basis for further research
- Knowing the potential of these seeds as a source of nutraceuticals or food ingredients, other researchers could extrapolate this idea to other agricultural waste products
- Other benefits:
    - Currently unexploited aromatic and medicinal plant seeds are shown to have potential as a new source of bioactive components with nutritional interest
    - The results may help develop approaches to enable full exploitation of aromatic and medicinal plants including processing residues, and hence, contribute achieving Goal 12 (Ensure sustainable consumption and production patterns) in the 2030 Agenda for Sustainable Development
    - Our findings suggest new avenues for rural development

Biography

Ms. María Quílez graduated in Food Technology from the UCAM Catholic University of Murcia (Spain) in 2017 and obtained her Master's degree in nutrition and food safety at the same university in 2018. She has extensive experience in the selection and food applications of aromatic and medicinal plants. Currently, she is a member of the Biotechnology Team at the IMIDA under the leadership of Dr. Abel Lozano. She has contributed to 20 scientific publications.

Mariela Mattos da Silva[1*], Rebeca Matos Groner[1], Gabriel Rosa de Sousa[1], Romário de Oliveira Silva Júnior[1], Giovanny Moraes Metzcker de Souza[1], Rodrigo Theófilo Valadares[2], Aline Delon Firmino[2], Patrícia Bourguignon Soares[3], Eustáquio Vinicius Ribeiro de Castro[4], Diolina Moura Silva[1]

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Metal contamination and oxidative system in Brazilian restinga fruits

The Restinga ecosystem consist of a mosaic of plant communities that cover the Brazilian sandy coastal plains, that can be strongly impacted by anthropic action, such as the Fundão Dam Failure, in 2015, which released nearly 50 million m3 of mining that were transported for over 600 km until reaching the Doce River mouth and the coastal zone. Plants growing in contaminated environment as this can present a decrease in growth and development, and thereby, the assessment of their reproductive resources is important, given the potential impacts on trophic chains and health of the human surrounding communities. We investigated the responses of Restinga species in the coastal zone affected by mining tailings contamination aiming to evaluate the metal (oide)s contamination levels and oxidative system response in fruits of six species with potential for biological activity: Chrysobalanus icaco L. (CHRY), Garcinia brasiliensis Mart. (GAR), Guapira pernambucensis (Casar.) Lundell. (GUA), Ouratea cuspidata (A. St.-Hil.) Engl. (OUR), Scaevola plumieri (L.) Vahl (SCA) and Tocoyena bulata (Vell.) Mart. (TOY). The study was carried in areas to the north and south of the Doce River mouth, northern coastal region of Espírito Santo state, southeastern Brazil in march 2020 and 2022. Samples of fruits and sediments were analyzed by inductively coupled plasma mass spectrophotometer (ICP-MS-NexION™ 300, Perkin Elmer, United States) and Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES-Optima 7000DV, Perkin Elmer) with which the element levels (As, Cd, Cr, Cu, Fe, Pb, Zn, Co, Mn, Sn, V and Ni) were determined in triplicate. For antioxidant system, metabolites and antioxidant capacity (by Ferric Reducing Antioxidant Power method) were estimated in fruits samples according to the plant species. The extent of cellular damage was also determined by quantification of Malondialdehyde (MDA) via thiobarbituric acid reactive substances. Higher levels of metal (loids) in fruits of Restinga species were related to increases in metal concentration (Mn, Ni, Al, Cr, Cu and Zn) in the sediment. Accumulations of Mn, Zn and Ni in fruits were associated with increased oxidative responses, especially in OUR, GUA and CHRY. Such accumulations in plant tissues resulted in increases in the production of phenolic compounds and antioxidants pigments, as well as their antioxidant capacity. However, in some species, as GUA and CHRY, a lower capacity for adjustment of the antioxidant system resulted in cell damage, as observed by the increase in MDA levels. These results show that the responses of the six Restinga species to metal contamination were species-dependent and directly related to the biota's ability to absorb mineral elements, highlighting the importance of understanding the pattern of accumulation of mineral elements in reproductive structures and its influence on quality of natural resources.

Audience Take Away Notes

- Knowledge of Restinga species with potential for natural antioxidants and new ecosystem services to a susceptible ecosystem
- Metal tolerance can be accompanied by an increase in antioxidant activity in a great number of Restinga species
- The capacity of response of Restinga species to metal contamination can be the basis for understanding the pattern of accumulation of mineral elements in reproductive structures and the quality of natural resources

Biography

Mariela Mattos da Silva Graduated in Biological Sciences from the Federal University of Espirito Santo (2006) and MS in Plant Biology from the same institution (2009). She Completed her PhD in Plant Physiology (2013) at the Federal University of Viçosa. She has experience in the Mechanisms of tolerance to abiotic stress via photosynthetic component response and antioxidant control in cultivated and native plants, as well as in Ecophysiology of fruit plants and Postharvest physiology. Currently, She is a researcher at the Photosynthesis Research Center (NEF/UFES), coordinated by Prof. Diolina Moura Silva, linked to Aquatic Biodiversity Monitoring Program (PMBA/FEST/UFES).

Maša Buđen[1*], Nevena Stevanović[1], Brankica Kartalović[1], Nikola Stanković[1], Nataša Ljubičić[1], Biljana Bošković[2], Mirjana Vukosavljev[1]

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Assessing the impact of salinity stress on basil (*Ocimum basilicum L.*) using vegetative indices

The demand for increased food production and the expansion of saline soil areas highlights the need to study plant tolerance to elevated soil salinity. Soil salinity is a significant environmental stressor that limits crop growth and yield by reducing water absorption due to osmotic pressure. Additionally, it leads to nutrient imbalances, particularly calcium and potassium, due to the excessive presence of sodium and chloride ions. Various stress factors influence plant yield. Utilizing phenotyping techniques, particularly multispectral bands, can help in early detection and management of plant stress.

This study aims to evaluate plant responses to salinity using a handheld multispectral sensor Plant-O-Meter to develop automated phenotyping techniques for detecting salinity stress in basil plants. Main goal of this research is to assess plant response to salinity using a multispectral handheld sensor via vegetational indexes, and to potentially develop automated phenotyping techniques to detect early responses to salinity stress in basil plants. This study was conducted on Genovese basil (Ocimum basilicum L., var. Basilicum). It is widely cultivated for the production of essential oils and is also marketed as an herb, either fresh, dried or frozen. Basil, commonly cultivated in regions afflicted by drought and salinity, stands as a prevalent aromatic and medicinal herb. The convergence of drought and salinity stress in agroecosystems, alongside their similar symptoms on plants, poses a challenge in distinguishing between them. To assess the impact of soil salinity, basil plants were exposed to 40 mM NaCl (T_2) and 80 mM NaCl (T_3) concentration for 60 days during the 2024 growing season. Also, water control was used (T_1). Plants were grown in pots in indoor growing conditions. Every treatment was carried out in three replicates. Handheld multispectral sensor was used to measure plant spectral reflectance. Three different Vegetational Indices (VI) were used to assess the plant response: Normalized Difference Vegetation Index (NDVI), Enhanced Vegetation Index (EVI) and Renormalized Difference Vegetation Index (RDVI). Calculation of f-ratio values show significant differences between treatments for each calculated index. Using ANOVA for multiple comparison analysis testing shows significant differences between NDVI values of T1 and T2, and T2 and T3. Same results were calculated for RDVI. EVI values show significant differences between all three treatments. These results indicate potential usage of NDVI, EVI and RDVI in stress prediction in basil using remote sensing tools.

Audience Take Away Notes

- The audience can apply the findings to enhance early detection and management of salinity stress in basil plants, improving crop yield and quality
- Provides data for developing practical solutions for optimizing crop management practices and mitigating the impact of salinity stress on plant health

- Other faculty members could utilize this research to expand their teaching and research endeavors in plant physiology, remote sensing, and precision agriculture
- The developed automated phenotyping techniques streamline data collection and analysis, offering a more efficient approach to monitoring plant health in agricultural systems

Biography

Maša Bućen studies Plant Protection at her Bachelor's studies, and graduated in 2019 at University of Novi Sad, Serbia. At the same University she studied Genetics, plant breeding and Seed science and got her Masters degree in 2021, studying plant response on salinity stress for her Masters thesis. Currently she is enrolled in PhD studies at Faculty of Agriculture in Belgrade, Serbia, studying Crop and Vegetable Production. She is employed as a Junior Researcher at BioSense Institute, Novi Sad, Serbia, where she works in the field of phenotyping using different remote sensing technologies.

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The effect of biopriming on quantitative and qualitative yield characteristics of *Melissa officinalis* L under water deficit stress in the second year of cultivation

In order to investigate the effect of Plant Growth-Promoting Rhizobacteria (PGPR) on quantitative and qualitative yield of Melissa officinalis L. under water shortage stress in the second year of cultivation, an experiment was conducted as a split plot based on a randomized complete block design with three replications. Three levels of water shortage (full irrigation, 75% and 50% of full irrigation) as the main factor and inoculation with plant growth-promoting rhizobacteria in 5 levels including control (no bacterial inoculation) and inoculation with four bacterial species (*Azospirillum*, *Bacillus* strain A, *Bacillus amyloliquefaciens* and *Stereptomises rimosus*) were considered as subfactors. Based on the results, the effect of different levels of water stress was significant ($P<0.001$) on leaf surface, leaf surface index, essential oil yield and biological yield essential while significant ($P<0.05$) on oil percentage. The effect of bacteria on leaf surface, leaf surface index, essential oil yield and biological yield was significant ($P<0.001$). The increase in water stress levels led to a decrease in all investigated traits except the percentage of essential oil while the inoculation of the plant with PGPR increased all traits compared to the control. In bacterial treatments, a reduction in the adverse effects of water stress was observed. According to the obtained results in this research, in order to improve the studied agronomic traits, inoculation with *Bacillus amyloliquefaciens* and inoculation with *Azospirillum* in order to improve the percentage of essential oil, is recommended.

Audience Take Away Notes

- The audience will be familiar with the biopriming using some PGPR strain
- These PGPR strains showed the potential to improve some agronomic traits

Biography

Dr. Mehrana Koohi-Dehkordi studied Agricultural Biotechnology at the Isfahan University of technology, Iran and graduated as MS in 2005. She then joined the research group of Prof. Altman at the Institute of IPK, Germany. She received her PhD degree in 2012 at the Shahrekord. She obtained the position of an Associate Professor at the PNU. She is one of the researchers of Agricultural Biotechnology Research Institute of Iran.

Meziane Kaci Z[1*], Laidoudi Djamila[2], Melahi Nawel[2], Ait Ouarab Dahbia[2], Boutekrabt Linda[3]

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Pomegranate peel (*Punica granatum L.*) Phytochemistry, quantification, identification of phenolic compounds and antioxidant activity

Pomegranate (Punica granatum L.) a popular fruit known for its rich nutritional value and diverse bioactive compounds. Discarded as waste derived from the processing of Punica granatum L., peel potential as a rich source of bioactive compounds with diverse pharmacological effects. This study focused to valorize the pomegranate peels the phytochemical composition of the methanolic extract of Punica granatum L. peel from three varieties of Algerian pomegranates. Containing Total Polyphenols (TP), Total Flavonoids (TF), Total Tanins (TT) as well as qualitative analyzes of phenolic compounds Individual high- performance liquid chromatography (HPLC) studies were evaluated. The results are expressed as mean ±SD and showed a high content of total polyphenols and tannins for peel extracts. Total polyphenols, flavonoids, alkaloids, as well as anthocyanins were detected. Pomegranate extracts also showed significantly high phenolic (124.6±0.409 to 757±0.3472 mg EAG/g extract and to antioxidant capacities some differences existed between these cultivars (73, 15 % to 92, 27 %).The high antioxidant activities may be due to the high content of phenolics and flavonoids in pomegranate extracts. Six phenolic compounds identified in the cultivars analyzed were gallic acids, cathechin, quercein, berberine, resorcinol and rutin. Following all these properties of Algerian cultivars, studies can be further extended to possibly exploit them through their application in the preservation of food products as well as their use as food supplements and nutraceutic.

Keywords: Pomegranate Eextract, Phytochemicals, Total Phenolics, Antioxidant Activity, HPLC.

Audience Take Away Notes

- The pomegranate is a fruit that is widely consumed in Mediterranean countries. Each year, several quantities of peels are released back into nature. Using the peels in herbal medicine or as a preservative, this will be very beneficial for the protection of health and the environment
- The public through this study will know the beneficial effects of pomegranate peels, especially in terms of antioxidants
- This provides a practical solution to a problem that could simplify or make a designer's job more efficient especially for pomegranate-producing countries
- It will be hoped that this study will help provide new information and resolve the design problem

Biography

Dr. Meziane Kaci Zoubida, Food Sciences Chemistry at the Saad Dahleb Blida 1 university, a and graduated as engineer in Food Sciences (Agronomy) in 1989. She had my Magester competition in 2007, where she joined the School Superieur Agronomique D'alger. She received her Majester diploma in 2011.Recruited as a teacher at the University of Tizi-Ouzou in 2012. She has her PhD degree in 2019 at the Saad Dahleb university. She is a teacher-researcher until today.

Natã Carlos Lira Madeira[1*], Rebeca Mattos Groner, Francisco Diogo Medeiros do Monte, Patrícia Bourguignon Soares, Diolina Moura Silva[2], Geraldo Rossoni Sisquini, Eustáquio Vinícius Ribeiro de Castro[3]

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Non-conventional edible plants in the Brazilian market

Non-conventional edible plants (PANCs, from Portuguese Plantas Alimentícias Não-Convencionais) are species that can serve as functional foods, easy to cultivate, with low technological costs, resistant to pests and diseases, and suitable for family farming. However, they have not yet been widely globalized or structured in a production chain. For example, the species Amaranthus spp. (Amaranth) has approximately 13-15% protein content, Chenopodium quinoa (Quinoa) typically contains about 12-18% protein, Moringa oleifera (Moringa) can vary, but on average it has 20 to 30% protein-these values can vary depending on factors such as soil type, climate, and growing conditions. The objective of this study is to assess the integration of PANC-derived products into the market and the structuring of production chains for the species listed in the National Register of Cultivars (RNC/MAPA). Bibliographic research was conducted using data provided by the Brazilian Agricultural Research Corporation (Embrapa), the Institute of Agriculture, Technical Assistance, and Rural Extension of Espírito Santo (Incaper), the Ministry of Agriculture and Livestock (MAPA), and Web of Science. The study evaluated the PANC production chain in Brazil, the market, products that can be offered, and scientific research on nutritional value and potential uses as pharmaceuticals and consumer goods. There are more than 10,000 species of PANCs in Brazil, but many of these species registered in the RNC/MAPA are not listed in catalogs or on company websites. In terms of the market, there is a growing demand for culinary-interest vegetables. The products sold include fresh produce, seedlings, seeds, ornamental plants, and food and beverages based on these species (flours, cakes, cookies, bread, beer, juices, teas, kombuchas, etc). According to Web of Science, 277 studies have been published on the topic of "non-conventional food plants." These studies range from proposals for production chains, the incorporation of PANCs into recipes, to the evaluation of the chemical compounds with biological activity in the products, among others. Therefore, PANCs have already played an important role in Brazilian culture, and the development of production chains and new products could be promising for the national economy.

Audience Take Away Notes

- PANCs, or Plants of Non-Conventional Use, are plants with high levels of proteins and minerals, which can be added to the diet of various people
- These plants offer a wide variety of flavors and textures, enabling the development of new recipes and products
- PANCs are resilient plants that can be grown in different environments, providing a possibility to meet the needs of people experiencing food insecurity

Biography

Natã Carlos Lira Madeira holds a PhD in Chemistry from the Federal University of Espírito Santo (UFES), He completed his graduation in Chemistry from the Federal Institute of Espírito Santo (IFES) and his Master's in Chemistry from the Federal University of Espírito Santo (UFES). His experience with NMR, FT-ICR MS, GC-MS and FT-IR experiments applied to petroleum, asphalt materials and natural products. He is currently a Postdoctoral fellow at FEST/UFES, He is participating in the Aquatic Biodiversity Monitoring Program Environmental (PMBA).

Nevena Stevanović[1*], Nikola Stanković[1], Maša Buđen[1], Marija Kopanja[1], Gordan Mimić[1], Miloš Pajić[2], Nataša Ljubičić[1], Sanja Brdar[1], Hilde Vaessen[3], Bernardo Maestrini[3], Frits van Evert[3]

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Setting-up a field experiment to collect data for the digital twin of crop growth

Gathering data on weather, soil conditions, and key plant growth parameters throughout the season enables running models for predicting crop growth and yield under specific abiotic conditions. The objective of this study was to set up a field experiment to collect data which could be used for the development of the digital twin. The purpose of the digital twin is to simulate crop growth in near-real time and adjust the state variables to reflect the situation in the field. The experiment was conducted in Čenej, Serbia, on a field where maize and soybean were cultivated. The field was divided into 12 different management zones based on multi-year average values of the NDVI and mechanical composition of the soil, with six zones designated for each crop. Soil samples were collected for detailed agrochemical analysis before sowing. Daily weather data were gathered from a meteorological station situated next to the field, together with the soil moisture sensors installed at different depths. Additionally, a set of three soil moisture sensors was placed in each zone. From the intensive growth phase onwards, biweekly data on in-situ measured Leaf Area Index (LAI), plant mass data and images from a drone with a multispectral camera were collected. Within each zone, in-situ LAI measurements were conducted destructively, and leaf area was measured in laboratory conditions, using LI-3100C Area Meter. The yield data were obtained at harvest from a GPS-equipped yield monitor on the combine harvester. The study explored how collected data can be used for the creation of a digital twin of maize and soybean using the WOFOST crop growth model, version 7.1, with water-limited production. It is shown that the drone images that were collected were not suitable for the calculation of LAI due to the lack of specific red-edge band, required by the existing formula. Low-cost soil moisture sensors, placed at different zones, provided unreliable measurements, first due to discontinuity in sensing by losing internet connection occasionally, and second having high standard deviation and values that did not match to the soil moisture measured at the station. However, the WOFOST simulation with data assimilation of in-situ measured LAI and station volumetric soil moisture content at 25 cm depth improved yield prediction. Root Mean Squared Error (RMSE) decreased from 1492.57 kg/ha to 1013.846 kg/ha for maize, and from 275.75 kg/ha to 240.66 kg/ha for soybean. Also, Mean Absolute Error (MAE) decreased from 1198.51 kg/ha to 872.82 kg/ha for maize, and from 240.71 kg/ha to 220.90 kg/ha for soybean.

Audience Take Away Notes

- How to gather and utilize weather data, soil conditions data, and key plant growth parameters throughout the vegetation season for predicting crop growth and yield under specific abiotic conditions
- The process of setting up a field experiment to collect data for developing a crop growth simulation

in real time and adjust variables to reflect field conditions
- Improves understanding of crop growth prediction and simulation, enabling them to make more informed decisions regarding agricultural practices and management
- Implement similar field experiments and data collection methods in their research or teaching, potentially advancing the field of precision agriculture and digital twin development
- Enhance the accuracy and efficiency of their work by utilizing advanced technologies and models for crop growth management and yield prediction

Biography

Nevena Stevanovic is a second-year PhD student at the Faculty of Agriculture, University of Belgrade. Upon enrolling in the doctoral program, she joined the Center for Biosystems at the BioSense Institute. Nevena's research is centered around monitoring the physiological and phenotypic responses of plants to various agroecological conditions, applying precision agriculture, and digitizing biological processes. Her aim of investigation is to understand plant adaptability and enhance their resilience to various stresses. Through her work, she gains experience in predicting plant behavior in different environmental conditions and contributes to timely decision making to reduce risks and improve yield in crop production.

Sabrina Garcia Broetto[1*], Geise Dalvi Dalcin[3], Gislane Chaves Oliveira[1], Leonardo Arenas Cavadas Buaiz de Lima[2], Juliana da Silva Penha[5], Lucas Pimentel Pereira[2], Patricia Bourguignon Soares[2], Eustaquio Vinicius Ribeiro de Castro[4], Diolina Moura Silva[1,2,3]

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Proximal and remote detection of the health of restinga vegetation from the Brazilian coastal region under the influence of mining tailings

Vegetation monitoring through orbital images has been increasingly efficient in environmental studies, such as the Normalized Difference Vegetation Index (NDVI), which has proven to be a simple indicator of vegetation health. Capturing this remote information recovers chlorophyll fluorescence and can be efficiently compared with chlorophyll fluorescence parameters obtained from portable in situ measurement fluorometers. The objective of this study was to compare and define a profile between photosynthetic parameters obtained in situ from plants in the Brazilian coastal Restinga and those obtained via remote sensing. This descriptive effort sought to predict whether the same response profile of vegetation impacted by mining tailings can be visualized using both remote sensing and in situ physiological tools. We used, in six sampling stations on the Brazilian coast impacted by tailings from the collapse of the Fundão dam (Mariana, Brazil), in situ analysis of chlorophyll a fluorescence using a portable fluorometer (Handy PEA, Hansatech Instruments®, King's Lynn, Norkfolk, United Kingdom). Series captured by the OLI (Operational Land Imager) and TIRS (Thermal Infrared Sensor) sensors on board the Landsat 8 satellite were also used, obtained from 2013 to January 2023, within the official sample polygons of each station. The quantitative results of the Normalized difference Vegetation Index (NDVI) at the sampling stations indicated that the time series presents higher values at the station south of the mouth of the Doce River and in areas further to the north. Temporally, comparing the periods before and after the arrival of tailings on the coast, the amplitude of NDVI values was greater at the Cacimbas (E6) and REBio Comboios (E7) stations, close to the mouth of the Doce River. This variation was more immediate in 2016, as a direct reflection of the arrival of the tailings plume on the coast as an indicator of impact on vegetation. At more distant stations it was possible to observe changes in NDVI later, as seen in Aldeia do Coco (E3). This index had a close correlation with the biophysical parameters of the vegetation. In the in situ temporal analysis, for PIabs, which is an indicator of photosynthetic performance, it was possible to observe the impact of contamination on vegetation, with lower PIabs values at the beginning of monitoring. These results may be related to photoinhibition processes, seen mainly in the rainy period of 2021, affecting photosynthetic performance, and which were also detected by NDVI. Mainly at sampling stations E3, E6 and E7, an increase in PIabs was observed, indicating an increase in their photosynthetic performance over time, as an indication of the vegetation's effective response to changes in environmental conditions. Vegetation monitoring, through vegetation indices, has been improving and proving to be an efficient tool for environmental preservation. It was possible to conclude that the Restinga, although still susceptible to variation in contamination by ore

tailings, presents its own temporal and spatial dynamics, pointing to an improvement in photosynthetic responses.

Audience Take Away Notes

- The effectiveness of vegetation indices combined with in situ analyzes in the ability to detect environmental impacts through changes in photosynthetic parameters
- Chlorophyll a fluorescence consists of a fast and non-invasive method that allows detecting, in loco, the intensity of the impact of stressors on vegetation
- The analysis allowed us to understand the temporal and spatial dynamics of vegetation in response to contamination, indicating an improvement in photosynthetic conditions, despite the persistence of contamination

Biography

Sabrina Garcia Broetto studied Biological Sciences at the Federal University of Espirito Santo, and graduated as MS in 2009. She received her PhD degree in 2013 at University of Sao Paulo. She then joined the research group coordinated by Prof. Diolina Moura Silva, at the Center for Photosynthesis Studies (NEF/UFES). Currently develops research as a postdoctoral researcher in the Aquatic Biodiversity Monitoring Program-PMBA/FEST/UFES.

Kanjanabhorn Aksornsit[1], Tanapon Chaisan[2], Sompid Samipak[1*]
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Genetic diversity of *Cannabis sativa* in Thailand assessed using DarTseq analysis

Cannabis sativa L., commonly known as hemp, originates from Central Asia and is renowned for producing cannabinoids—compounds that hold significant promises for therapeutic applications. As interest in hemp continues to rise both globally and within Thailand, the Thai government has recently approved the cultivation of hemp for commercial, medical, and research purposes. This shift highlights the necessity of a thorough assessment of hemp varieties, focusing not only on their physical characteristics but also on their genetic makeup. Such evaluations are essential for guiding future breeding programs and ensuring the long-term viability of the hemp industry in Thailand.

In this research, we performed an in-depth genetic analysis on 37 hemp samples collected from different regions across Thailand, along with two reference varieties, RPF-1 and RPF-2. To achieve this, we utilized advanced genetic tools, specifically DArTseq genotyping-by-sequencing and whole-genome sequencing, which allowed us to identify 3,609 Single Nucleotide Polymorphisms (SNPs). Through STRUCTURE analysis and principal component analysis, we identified three genetically distinct clusters among the hemp samples. The genetic differentiation among these clusters was measured using FST values, which ranged from 0.064 to 0.079, indicating a low to moderate level of genetic separation. Additionally, the Analysis of Molecular Variance (AMOVA) showed that 4.83% of the variance was among populations, further supporting this finding. The study also revealed low to moderate genetic diversity (expected heterozygosity=0.348; observed heterozygosity=0.092) and a high inbreeding coefficient (0.737) within these clusters.

The insights gained from this genetic analysis are crucial for developing specific primer sets that can effectively differentiate between hemp varieties. These tools will be instrumental in advancing future breeding programs, enabling the selection and cultivation of high-quality hemp strains tailored to diverse applications.

Audience Take Away Notes

- Audiences will gain insights into the genetic diversity present in Cannabis sativa (hemp) samples collected across Thailand. They will understand how diverse or homogeneous the hemp population is within the country.
- The presentation will cover the identification of three distinct genetic clusters among the Thai hemp samples. Audiences will learn about the methods used to uncover these clusters (STRUCTURE analysis and principal component analysis) and the significance of these findings in terms of genetic differentiation and potential breeding strategies. This information can be used by the audience to plan future research projects.
- Additionally, the presentation will discuss the high inbreeding coefficient found in the study, shedding light on the potential risks associated with limited genetic diversity within these hemp populations.

Biography

Sompid Samipak completed his bachelor degree and she studied Biology in the University of Chicago. She then joined the research group of Dr. Roger Chetelat at the University of California Davis, USA, where he received a PhD in Genetics. She then returned to Thailand and obtained a position as an assistant professor in Genetics Department at Kasetsart University, Bangkok, Thailand.

D. Valentina Mariscal-Aguayo[1*], Heriberto Estrella-Quintero[1], José Enrique Salas-Barboza[2], Gabriela Garibay-Prado[3]

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Online monitoring of the extension process in the vanilla (*Vanilla planifolia Jackson*) crop in Puebla and Veracruz, Mexico

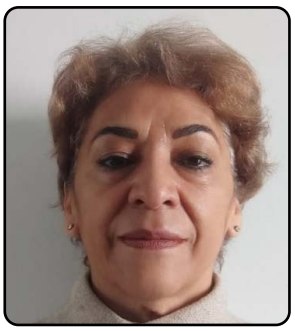
Vanilla, a plant native to Mexico, is a product demanded in the refreshments and culinary industries, and it has productive potential in the country; however, it is necessary to improve the production system. The objective of the work was to implement a technology transfer model to develop vanilla agribusinesses. Work was carried out in the municipalities of San José Acateno and Hueytamalco, Puebla, and Papantla, Veracruz, during nine months in 2016, working with 81 producers and five advisors. Chapingo-Agropec Star advisory and consulting model was implemented, which consisted of computer and communication technology with specialized software for the development and registration of the work carried out in the vanilla production process. Extension workers were trained in the management of the platform and production disciplines. Advising and training were provided to producers by extension workers. The producers have 0.50 hectares, on average, for crop production. 90% of the producers are over 60 years old, and 50% are of Totonac origin. Vanilla production is a secondary source of income and is carried out only out of tradition or because the land with the crop was inherited. Yields range from 50 to 300 kg/ha of green pod. With the training courses, producers achieved the implementation of different innovations, such as bot-cuttings guides (51.85 %), application of compost (43.21 %), pollination (38.27 %), and weed control (37.04 %). Vanilla cultivation in Mexico is carried out, in a traditional way, where the properties are small, and the cultivation tasks are carried out by the same producer and his family, without using specialized technologies. The productivity of the agribusinesses is low. Online monitoring of the crop system allows for verification in real-time of the activities realized and the generation of indicators for identifying the areas to improve.

Audience Take Away Notes

- To know a model for monitoring, control, and evaluation of the production of vanilla crops
- The model consists of the use of computer and communication technology with specialized software for the development and registration of the work carried out in the vanilla production process, but this model can be used in other crops
- This research could be used by other faculty to facilitate the information registration and analysis

Biography

D. Valentina Mariscal A. studied the B.Sc. In Animal Production at the Universidad Autónoma Chapingo, México, graduated with as M.S. in 1990 in Chapingo and Ph.D. in 1994 in the University of Nebraska-Lincoln, U.S.A. Professional Development: Agribusiness Development; Research area: Endocrinology and reproductive physiology in pigs and cattle, Digital agribusiness management. Extension Activities: Technology transfer and development of enterprises with Producer Organizations. Publication 50 in research and extension journals.



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Online monitoring of training for cocoa (Theobroma cacao l.) producers in Tabasco, México

Promoting, encouraging, and implementing the development of capacities in producers in an extension program allows them to participate in solving problems derived from the production process, and at the same time, develop productive self-sufficiency. However, online monitoring of the process is of vital importance to ensure its quality. A project was carried out with cocoa agribusinesses in the municipality of Cárdenas, Tabasco; where one of the objectives was to implement training workshops for producers in the technical management of cocoa cultivation (Theobroma cacao L.) to improve their productivity. Part of the Chapingo –AGROPEC Star Advisory and Consulting model was used, which consisted of using computer technology and communication with specialized software, online monitoring of the training workshops given, and capacity development in producers. 100 producers and five extension agents participated. It began with an induction workshop to inform the producers of the purpose of the study, as well as the obligations of the actors involved. 38 training workshops were carried out, which were focused on resolving the weaknesses in the technical management of cocoa cultivation that have been identified in the field. The result of the digital monitoring of the development of capacities in producers and the identification of weaknesses in agribusinesses determined the implementation of activities on the farms, such as control of pests and diseases (97.4%), and improvement in soil fertility (64.10%), and grafted (51.28%). In cocoa cultivation, moniliasis causes considerable losses in crop yield and production. With the use of the model, the extension agents helped to provide online monitoring of the development of capacities in producers considering the skills and management developed in practice to improve the productivity of agribusinesses.

Audience Take Away Notes

- They will learn about the digital agricultural innovation platform used at work.
- They will know the importance of digitizing information in a training process.
- They will know how to monitor a training process online.
- They must use the AGROPEC Star digital agricultural innovation platform
- Other teachers can use it for research and teaching.
- The methodology is a practical solution to make the work of an extension agent easier.

Biography

HERIBERTO ESTRELLA QUINTERO, Bachelor (1978) and M.Sc. (1984) in Animal Production, Husbandry, Universidad Autónoma Chapingo (UACh) (1978). From 1981 to date, Research Professor at the UACh, teaching Undergraduate and Postgraduate, Courses in Digital Agribusiness Administration, and Advisor of 3 master's and 5 bachelor theses; Publications at the national level 65 and internationally 19. Generation and implementation of the Precision Digital Extensionism Model in different product systems and regions of Mexico.

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Effect of polyamines and abscisic acid on germination and enzyme activity of sorghum (s.bicolor) lines

The study aimed to investigate the effect of plant hormones (PAs and ABA) on the germination and enzymatic activity of selected three Sorghum bicolor L. lines (94, L58 and 2) under saline conditions. Seeds were treated with different concentrations of NaCl solutions (EC0, EC4, EC6, EC8 and EC10) in the presence of Spm, ABA and Spm+ABA. The percentage of germination was higher in the seeds treated with either Spm or ABA alone than those treated with NaCl only. Exogenous application of Spm and ABA expressed different responses to amylase and catalase enzyme activity. The results revealed that the activity of amylase was lower in the seeds treated with Spm or ABA alone than those treated with NaCl. The catalase activity was higher in the seeds treated with NaCl than other treatments. Plant hormones (Spm and ABA) affected positively on percentage of germination of sorghum lines under saline conditions, while their effect on amylase and catalase activity was not significant. On the other hand, there was no considerable effect on the interaction between ABA and Spm.

Audience Take Away Notes

- The interaction between plant hormones and salinity stress.
- The importance if sorghum species
- The effect of salinity stress on amylase and catalase activity

Biography
DR. Z. Kanani studied Botany at University of Khartoum/ Sudan. In 2017, she obtained her PhD from the same institute. Dr. Kanani is interested in plant tissue culture, plant physiology, plant hormones, plant stresses, and plant biochemistry.

BOOK OF ABSTRACTS

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5th Edition of Global Conference on

Agriculture and Horticulture

September 08-10, 2025 | Valencia, Spain | Hybrid Event

https://agri-conferences.com/

10th Edition of Global Conference on

Plant Science and Molecular Biology

September 08-10, 2025 | Valencia, Spain | Hybrid Event

https://plant-science-biology-conferences.magnusgroup.org/

Questions? Contact

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