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2026

13-14
JULY

2nd World Congress on

ADVANCES IN PLANT SCIENCE AND PLANT BIOLOGY

Peers Alley Media
701 West Georgia Street, Suite 1500 Vancouver, V7Y 1C6, Canada

SCIENTIFIC PROGRAM

DAY 01
MONDAY

JULY 13, 2026

08:20-08:50	**Registrations**
08:50-09:00	**Inaugural Ceremony**
Moderator	**Srinivasa Rao Mentreddy,** *Alabama A&M University, USA*

Topics: Agricultural Biotechnology | Plant Genomics | Plant Pathology | Soil Plant Interactions | Sustainable Agriculture | Plant Genetics | Plant Ecology | Plant Breeding | Plant Metabolism | Plant-Environment Interactions

Distinguished Speaker Talks	
Session chair	**Sabit Erşahin,** *Iğdır University, Türkiye*
Session chair	**Indira Singh,** *Indian Institute for Human Settlements, India*
09:00-09:20	Title: Evaluation of Basil (*Ocimum* spp.) for Antidiabetic and Antimicrobial Properties **Srinivasa Rao Mentreddy,** *Alabama A&M University, USA*
09:20-09:40	Title: Modulation of Cuticle Composition and Stomata Frequency for Improving Drought Tolerance in Wheat **Nikolai Borisjuk,** *Institute of Cell Biology and Genetic Engineering, Ukraine*
09:40-10:00	Title: Exploring Geospatial Link between Soils and National Intelligence Quotient **Sabit Erşahin,** *Iğdır University, Türkiye*
10:00-10:20	Title: Targeted Metabolomics of Root Exudates Secreted by Wheat Grown under Heat Stress **Seema Garcha,** *Punjab Agricultural University, India*

10:20-10:40	Title: Unique Bacterial Community Characteristics of Forest Soil Compared to Grassland Soil: A Study of Miyawaki Forest vs. Grassland in Nashik, India **Indira Singh,** *Indian Institute for Human Settlements, India*
GROUP PHOTO 10:40-10:50	
REFRESHMENT BREAK 10:50-11:10	
11:10-11:30	Title: Genetic Diversity of Tunisian Tall Fescue Germplasm: Implications for Breeding and Conservation **Nidhal Chtourou-Ghorbel,** *University of Tunis El Manar, Tunisia*
11:30-11:50	Title: Yield Dynamics and Sustainable Management of *Boswellia sacra*: Insights from Oman's Diverse Agro-Ecological Zones **Ahmed Bakhit Salim AL-Shanfari,** *Ministry of Agriculture, Fisheries, Wealth & Water Resources, Dhofar Governorate, Sultanate of Oman*
11:50-12:10	Title: Experimental Evidence of Plant Thermoregulation and its Implications for Climate Stability **Peter Paul Bunyard,** *Independent Scientist, UK*
12:10-12:30	Title: Proteins of *Pycnoporus sanguineus* have Nematicidal Activity and Induce Resistance to *Meloidogyne* spp. in Micro-Tom Tomato Plants **Olivia Diulen Costa Brito,** *Western Paraná State University (UNIOESTE)- Origem Biotecnologia, Brazil*
12:30-12:50	Title: Species Composition and Distribution Mapping of *Schleichera oleosa* in Doon Valley of Uttarakhand Himalaya **Ombir Singh,** *Forest Research Institute, Dehradun, India*
12:50-13:10	Title: Evaluation of Genetic Diversity and Agronomic Performance of Perennial Ryegrass and Tall Fescue Endophytically Infected by *Neotyphodium* under Tunisian Conditions **Salma Ghariani,** *University of Tunis El Manar, Tunisia*

GROUP PHOTO 13:10-13:20	
LUNCH BREAK 13:20-14:00	
14:00-14:20	Title: A Century-Old Coal Company: Hullera Vasco-Leonesa
	Leonardo Caruana de las Cagigas, *University of Granada, Spain*
14:20-14:40	Title: Most Appropriate Nozzle of Six-Rotor UAV for Prescribed Spraying Liquid in Tea Plantation under Combined Effects of Downwash Flow Structure
	Lin Zhu, *Anhui Agricultural University, China*
14:40-15:00	Title: Analysis of Electrolyzer Cell Memory *via* Fractional Calculus and Machine Learning for Efficient Green Hydrogen Production
	Silvio Tadeu Teles da Silva, *Federal University of Pará – UFPA/ITEC/PPGEE, Brazil*
15:00-15:20	Title: The Functionality of Starch-Based Straws Combined with Fiber-Based By-Products
	Li Guo, *Shandong Key Laboratory of Healthy Food Resources Exploration and Creation, Qilu University of Technology (Shandong Academy of Sciences) & School of Food Science and Engineering, China*
15:20-15:40	Title: Lipid-Rich Fraction from *Tristerix corymbosus* Exhibits Potent Antimicrobial Activity against Multidrug-Resistant Bacteria
	Maité Rodríguez-Díaz, *Universidad Tecnológica Metropolitana, Chile*
15:40-16:00	Title: School Gardens as Sustainable Food and Medicinal Plant Systems in the Verde para Sempre Extractive Reserve: Integrating Plant Science and Traditional Knowledge in the Brazilian Amazon
	Ana Paula Simões Castro, *Federal University of Southern and Southeastern Pará, Brazil*
REFRESHMENT BREAK 16:00-16:20	

16:20-16:50	Title: Sowers of the Natural World **Aura Maryori Cañón Vargas & Sandra Patricia Melo Mora,** *Santa Librada School, Colombia*
16:50-17:10	Title: Physiological Growth of Potato (*Solanum tuberosum* L.) Following Post-Harvest Seed Treatment with 3-decen-2-one (SmartBlock®) **Nomali Ziphorah Ngobese,** *North-West University, South Africa*
17:10-17:30	Title: Effect of Climate Change on Energy Security in Sub-Saharan Africa: The Role of Renewable Energy Adoption **Lord-Freeman Dunyoh,** *Jasikan College of Education, Ghana University of Professional Studies, Ghana*
17:30-17:50	Title: Genetic Diversity of Phyllosphere Microbiome as a Bioindicator of Urban Air Pollution **Mahwish Batool Kazmi,** *Institute of Molecular Biology and Biotechnology, Bahauddin Zakariya University, Pakistan The Women University, Pakistan*
17:50-18:10 (Pre-Recorded)	Title: An Alternative Technique to Produce a New Low Alcohol Wine **Barbara la Gatta,** *University of Foggia, Italy*
NETWORKING	
END OF DAY 1	

SCIENTIFIC PROGRAM

DAY 02
TUESDAY

JULY 14, 2026

08:50-09:00	**Introduction**
Moderator	**Ahmed Bakhit Salim Al Shanfari,** *Ministry of Agriculture, Fisheries, Wealth & Water Resources, Dhofar Governorate, Sultanate of Oman*

Topics: Agricultural Biotechnology | Plant Genomics | Plant Pathology | Soil Plant Interactions | Sustainable Agriculture | Plant Genetics | Plant Ecology | Plant Breeding | Plant Metabolism | Plant-Environment Interactions

Distinguished Speaker Talks	
09:00-09:20	Title: Explorating PGPRs and Green Synthesized Nanoformulations in Mitigating Diseases of Soybean and Productivity Enhancement in India
	Shamarao Jahagirdar, *University of Agricultural Sciences, India*
09:20-09:40	Title: Shilajit versus Placebo in the Management of Patients with Moderate Coronavirus
	Royanama Rahimi, *Mashhad University of Medical Sciences, Iran*
09:40-10:00	Title: Effects of Dopamine on Reducing Salt Stress Damage in Pepper (*Capsicum annuum* L.) at Morphological, Physiological, Biochemical and Molecular Levels
	Ertan YILDIRIM, *Atatürk University, Türkiye*
10:00-10:10 (POSTER)	Title: Mikrobiota of Plants in Metal Polluted Environments
	Oleksandra Kutinova, *Jagiellonian University, Poland*
10:10-10:20 (POSTER)	Title: Review of Phytoplasmas Associated with Grapevine Yellows in Georgia
	Iveta Megrelishvili, *LEPL Scientific-Research Center of Agriculture, Georgia*

10:20-10:30 (POSTER)	Title: Distribution of Viral Infection in Georgian Varieties of *Vitis vinifera* **Zurab Kidesheli,** *LEPL Scientific-Research Center of Agriculture, Georgia*
GROUP PHOTO 10:30-10:40	
REFRESHMENT BREAK 10:40-11:00	
11:00-11:10 (POSTER)	Title: Sensitivity of Georgian *Vitis vinifera* L. Varieties to Grapevine Yellows Diseases **Nino Maziashvili,** *LEPL Scientific-Research Center of Agriculture, Georgia*
11:10-11:20 (POSTER)	Title: Rapid Dereplication of Trunk Bark Constituents of *Croton sylvaticus* and Molecular Docking of Terpenoids from Three Congolese *Croton* Species **Bienvenu Mvingu Kamalandua,** *Université de Kinshasa, Democratic Republic of the Congo*
11:20-11:30 (POSTER)	Title: Ameliorative Effects of Strigolactone on Tolerance to Lead Stress on Lettuce (*Lactuca sativa* L.) Plants **Esma Yigider,** *Atatürk University, Türkiye*
11:30-11:40 (POSTER)	Title: Ameliorative Effect of Humic Substances on Physiological and Morphological Responses of Lettuce (*Lactuca sativa* L.) under Flooding Stress **Melek Ekinci,** *Atatürk University, Türkiye*
11:40-11:50 (POSTER)	Title: Inhibitory Effect of Exogenous Methionine on Drought Stress in Tomato Seedlings **Murat Aydin,** *Atatürk University, Türkiye*
11:50-12:10	Title: Comprehensive Population Analysis in the System of Studying and Conserving the Biodiversity of Forest Ecosystems **Maryna Sherstiuk,** *Sumy National Agrarian University, Ukraine*
NETWORKING	
END OF DAY 2	

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3RD WORLD CONGRESS ON

ADVANCES IN PLANT SCIENCE AND PLANT BIOLOGY

July 2027 | Paris, France

Adv. PSPB 2026

PEERS ALLEY MEDIA

DAY 01

2nd WORLD CONGRESS ON

ADVANCES IN PLANT SCIENCE AND PLANT BIOLOGY

JULY 13-14, 2026 | BERLIN, GERMANY

SPEAKER TALKS

Evaluation of Basil (*Ocimum* spp.) for Antidiabetic and Antimicrobial Properties

Srinivasa Rao Mentreddy[1], Suresh Mathews[2], Manjula Bomma[1], Cedric Sims[3] and **Florence Okafor[1]**

[1]Alabama A&M University, USA
[2]Samford University, USA
[3]Frisk University, USA

Herbal products with a market value of over USD 100 billion in 2024 continue to gain popularity as health supplements worldwide. About 80% of the world's population relies on herbal remedies, and 25% of the pharmaceutical drugs are plant-based. Among a wide range of medicinally active plants, basil (*Ocimum* spp.), with over 150 species and a rich profile of essential oils, has a myriad of medicinal properties, including treatment for chronic diseases such as cancer and diabetes. In this study, the variation among *Ocimum* species in **antidiabetic** and **antimicrobial** activity against two human pathogens, *Escherichia coli* and *Staphylococcus pyogenes*, was evaluated using leaf methanolic extracts from nineteen accessions belonging to seven *Ocimum* species.

Antidiabetic Activity: Antidiabetic Activity was assessed using an α-glucosidase inhibitory assay with methanolic leaf extracts, with acarbose as a positive control. The *O. basilicum* accession PI 173706 and PI 652066 (*O. campechianum*) exhibited mild inhibitory activity against α-glucosidase, with 14% and 19% inhibition, respectively, compared to acarbose, which demonstrated 99% inhibition. In contrast, PI 500952 (*O. gratissimum*) showed maximal inhibitory activity of 80%, comparable to acarbose.

Antimicrobial Activity: The bacterial cultures grown overnight on BHI broth at 37°C were diluted to a final concentration of ~105 CFU/ml, and pure cultures served as the Control. Bioscreen C, with a wideband filter between 420 and 580 nm, determined bacterial growth rate. The percentage reduction in pathogen colonies was calculated as the difference in OD units between treatments and the Control. The growth reduction of *E. coli* ranged from 20% (*O. americanum*) to 91% (*O. basilicum*). *O. basilicum* and *O. tenuiflorum* reduced the growth of *E. coli* by 91% and 88%, respectively, and were the most effective species. The growth reduction in *S. pyogenes* ranged from 10% by *O. campechianum* to 76% by *O. tenuiflorum* (MSR 1). *O. basilicum (*PI 652071), *O. selloi* (PI 511865), *O. × africanum* (PI 500942), and *O. gratissimum* (PI 652067) reduced the growth of *S. pyogenes* by more than 50% to

the Control. The variation between and within species indicates the need for further research to increase the potency of *Ocimum* species as antidiabetic and antimicrobial agents.

Presenter:
Srinivasa Rao Mentreddy
Alabama A&M University, USA

Modulation of Cuticle Composition and Stomata Frequency for Improving Drought Tolerance in Wheat

Nikolai Borisjuk[1], Olha Lakhneko[1,2], Anton Stepanenko[1,3], Yuliia Rymar[1] and **Bogdan Morgun**

[1]Institute of Cell Biology and Genetic Engineering, Ukraine
[2]Plant Science Biodiversity Center, Slovak Academy of Sciences, Slovak Republic
[3]Leibniz Institute of Plant Genetics and Crop Plant Research (IPK), Germany

Water preservation during the dry periods, which relies on the ability to retain accumulated water reserves, is one of the essential mechanisms in plant adaptation to drought. The major portion of water lost in plants occurs through leaf surfaces, contributed from stomatal transpiration and cuticle diffusion. Reduction of this loss is a promising strategy toward improving crops drought tolerance. During the recent years leaf cuticle and stomata became a subject of intensive investigations in relation to improve water use efficiency in cereals. Our previous studies characterized biochemical features of cuticle and revealed a number of molecular factors controlling leaf surface features related to drought tolerance. In particular, overexpression of the *TaSHN1* in wheat affected composition of cuticle waxes, frequency of stomata, drought tolerance and performance of the transgenic lines. Here, we present new data on leaf surface analysis in wheat varieties with contrasting drought tolerance cultivated in Ukraine with emphasis on stomata and characterization of key factors controlling stomata frequency. In particular, we obtained the data on cultivar-specific expression and promoter structure of genes encoding EPF polypeptides and transcription factor MUTE, the key components controlling stomata biogenesis. Based on these results, we suggested a gene editing strategy for modulating stomata frequency in wheat with the prospect of improving wheat performance under water-restricted conditions.

Presenter:
Nikolai Borisjuk
Institute of Cell Biology and Genetic Engineering, Ukraine

Exploring Geospatial Link Between Soils and National Intelligence Quotient

Sabit Erşahin[1], Faruk Tohumcu[1] and **Rüştü Çallı[2]**

[1]Department of Soil Science and Plant Nutrition
Agricultural Faculty, Iğdır University, Türkiye
[2]Department of Architecture and Urban Planning
Iğdır Technical Sciences Vocational School, Iğdır University, Türkiye

Global maps suggest a notable spatial correspondence between soil fertility and mean national intelligence quotient (MNIQ), raising questions about whether soil-related nutritional constraints may influence human cognitive outcomes at large scales. This study investigates the global relationship between soil fertility and MNIQ across 126 countries. A Soil Fertility Index (SFI) was developed by integrating soil taxonomic information and deviations of median soil pH from an optimal reference value (pH 6.5). Country-level SFI values were calculated using GIS-based spatial analysis and evaluated against MNIQ using correlation, regression, and geostatistical methods. The results indicate a significant positive correlation between SFI and MNIQ ($r = 0.58$, $P < 0.001$), with SFI explaining 34% of the variation in national IQ values. Incorporating soil pH deviation substantially improved explanatory power compared with soil type alone. Regression analysis identified several outliers, reflecting the influence of food import dependence and socioeconomic factors. Summary statistics of soil and intelligence variables are presented in Table 2. Semivariogram and cross-semivariogram analyses revealed strong and comparable spatial dependence for SFI and MNIQ, suggesting that both variables are structured by spatial processes operating over similar global ranges. These findings provide evidence of a significant spatial association between soil fertility and national cognitive outcomes. While not implying causality, the results highlight soil fertility as a potentially important environmental context influencing long-term human development and global inequality patterns.

Presenter:
Sabit Erşahin
Iğdır University, Türkiye

Targeted Metabolomics of Root Exudates Secreted by Wheat Grown under Heat Stress

Seema Garcha and **Jasnoor Kaur Brar**

Department of Microbiology, Punjab Agricultural University, India

Roots of developing plants secrete root exudates. The composition of root exudates is mainly an interplay between primary and secondary metabolites and it changes in response to biotic and abiotic stress. We choose to look at root exudate in relation to heat stress because in recent years heat stress has adversely impacted wheat yield in Indo-Gangetic plains of India. Cultivars PBW 826 and PBW 343 and landrace C306 were grown up to juvenile stage. Heat stress, 40°C/4h was given to the seedlings for a week. Root exudates were sampled at 3 days, 7 days and 10 days after application of heat stress. It was filter sterilized and concentrated by lyophilization for HPLC analysis. Concentrations of organic acids (succinic acid, oxalic acid, fumaric acid, malonic acid, lactic acid, citric acid, formic acid) and amino acids (glutamic acid, proline, alanine, aspartate, serine, methionine, isoleucine, phenylalanine, tryptophan) was estimated. The concentration of these compounds was found to be significantly higher in root exudates sampled from landrace C306 compared to cultivars PBW826 and PBW343. Intriguingly, proline was absent in root exudates sampled from cultivars. However, it was detected in the landrace. We attempted to relate heat stress with bacterial community composition. Firmicutes were abundantly present in all varieties but Proteobacteria varied across varieties. The diversity indexes reflected these variations. Conclusively, root exudate composition is influenced by heat stress which in turn manoeuvres rhizospheric bacterial community structure.

Presenter:
Seema Garcha
Punjab Agricultural University, India

Unique Bacterial Community Characteristics of Forest Soil Compared to Grassland Soil: A Study of Miyawaki Forest vs. Grassland in Nashik, India

Indira Singh[1], Kanika Bansal[1], V. Vaishnavi[1], Raghunath Reddy[2] and **Jagdish Krishnaswamy[1]**

[1]School of Environment and Sustainability, Indian Institute for Human Settlements, India
[2]Department of Soil Science, Regional Horticultural Research and Extension Centre (RHREC), College of Horticulture Gandhi Krishi Vigyana Kendra (GKVK), India

Declining urban ecosystems demand interventions to overcome imminent threats due to reducing biodiversity, deteriorating air-quality, increasing urban heat-island effects and looming climate challenges. Miyawaki forests are recognized as a useful means of restoring urban ecosystems. These forests comprising a dense growth of native tree-species host a wide variety of biodiversity including birds, insects, reptiles, and amphibians. However, very few attempts have been made to characterize the soil microbial communities that form the foundation of this forest ecosystem. Here we used 16S amplicon sequencing based characterization of soil bacteriome of a two-year-old Miyawaki forest and compared it with that of the neighboring grassland. Soil sampling in triplicates from the Miyawaki forest and grassland were done over two seasons – wet (August) and dry (March). Results indicated that the vegetation-type defined the bacterial community structure. The Miyawaki forest with dense tree-growth allowed poor-sunlight penetration and involved heavy litter-fall and poor oxygenation in the forest-floor. Thus, the forest soil bacteria were found to be enriched in organic matter decomposers with ability to tolerate the anoxic forest-floor conditions. In contrast, the grassland bacteria comprised primarily of photoautotrophs with hyperoxia-stress management abilities. Although the bacterial abundance was lower in the dry season compared to the wet season in both the ecosystems, the functional stability of the forest bacteria was pronounced, indicative of resilience building. Hence, the study demonstrates the specific evolutionary patterns of soil bacterial communities in response to diverse ecosystems and provides clues to the microbiome anticipated in a young forest.

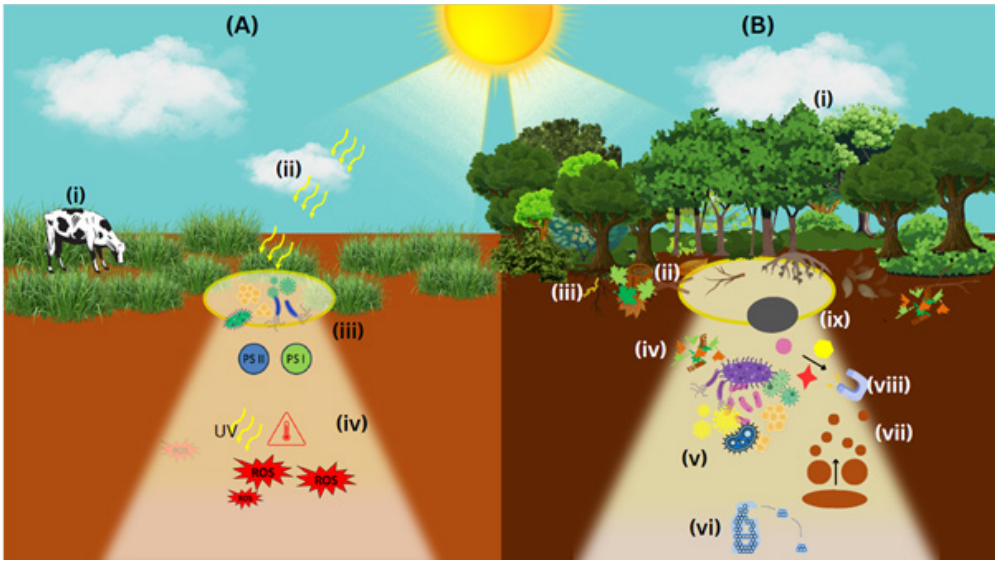

Figure: Comparative schematic representation of (A) grassland ecosystem and (B) Miyawaki forest. (A) The nearby grassland is characterized by (i) cattle grazing, (ii) bright, sunlit, open soil (iii) dominance of photoautotrophs, and (iv) elevated temperature and UV irradiance results in elevated levels of reactive oxygen species (ROS). In contrast, (B) Miyawaki forest exhibits (i) dense canopy cover, (ii) accumulation of forest litter, (iii) deep root systems with active mycorrhizal associations, (iv) breakdown of complex forest litter, (v) high bacterial diversity, (vi) exopolysaccharide production and biofilm formation (vii) sporulation activity, (viii) nutrient scavenging processes (ix) formation of anoxic microsites.

Presenter:
Indira Singh
Indian Institute for Human Settlements, India

Genetic Diversity of Tunisian Tall Fescue Germplasm: Implications for Breeding and Conservation

Nidhal Chtourou-Ghorbel[1], Hala Chadded[1] Salma Sai-kachout[2] and **Neila Trifi-Farah[1]**

[1]Laboratory of Molecular Genetics, Immunology and Biotechnology (LR99ES12), Faculty of Science of Tunis, Farhat Hached University Campus, University of Tunis El Manar, Tunisia

[2]Laboratory of Animal and Forage Production, INRAT, National Institute of Agronomic Research of Tunis, Tunisia

Tunisia's natural flora includes diverse forage and pasture species, notably tall fescue (*Festuca arundinacea* Schreb., syn. *Lolium arundinaceum* (Schreb.) Darbysh.), a cool-season perennial grass valued for forage, pasture, and turf in temperate and Mediterranean climates. Its tolerance to wet soils, alkalinity, and salinity, combined with dense turf production, makes it suitable for marginal sites and soil conservation. Tall fescue can be cultivated in monoculture or mixed with legumes and other grasses, grazed or cut, and harvested as hay or silage. Tunisian hexaploid accessions show excellent fall growth, suggesting their potential as breeding germplasm when crossed with European varieties. However, these genetic resources are threatened by overgrazing, irregular rainfall, and rangeland loss.

Several studies have been conducted to characterize Tunisian tall fescue germplasm from agronomic, morphological, and molecular perspectives. These investigations aimed to assess the genetic diversity and population structure of local accessions, identify promising genotypes for breeding, and explore gene flow between wild and cultivated populations. Different marker systems (ISSR, SRAP, CDDP, and CBDP) were applied alongside morpho-agronomic evaluations to analyze the levels and patterns of genetic variation among populations collected from northern and northwestern Tunisia. The results revealed high genetic variability with no clear geographical structuring, reflecting adaptation to heterogeneous environments and gene flow. The close genetic relationship between spontaneous and cultivated forms provides opportunities for developing superior cultivars and conserving local germplasm.

These findings highlight the importance of integrating genetic diversity assessments into management strategies to enhance the resilience and pro-

ductivity of tall fescue under changing environmental conditions.

Presenter:
Nidhal Chtourou-Ghorbel
University of Tunis El Manar, Tunisia

Yield Dynamics and Sustainable Management of *Boswellia sacra*: Insights from Oman's Diverse Agro-Ecological Zones

Ahmed Bakhit Salim AL-Shanfari

Agriculture & Livestock Research Department of Dhofar, Ministry of Agriculture, Fisheries, Wealth & Water Resources, Dhofar Governorate, Sultanate of Oman

The frankincense tree (*Boswellia sacra*) is a key economic plant in Oman, but its populations have recently declined sharply due to improper tree-tapping practices. Current scientific understanding of frankincense trees in Oman is limited, particularly regarding yield variations across different agro-ecological zones, the impacts of resin extraction methods and cutting frequencies on yield, and issues related to plant regeneration. This study was conducted in four distinct agro-ecological zones, involving a total of 180 healthy, non-harvested frankincense trees, with four replications for each location. The highest olibanum yield was recorded after the fourth tapping pick. Average resin yields across the four locations were 650 g, 620 g, 360 g, and 470 g per tree per season over ten tapping sessions. The findings revealed a positive correlation between olibanum yield and factors such as stem diameter, crown size, trunk size, and the number of tapping spots, while an inverse correlation was observed with tree flowering and elevation. Sustainable harvesting practices for frankincense trees should include limiting cut depth to the phloem without reaching the hardwood, avoiding cuts in sensitive areas of the tree bole, maintaining adequate distances between cuts, employing traditional tapping methods, and designating specific periods during which tapping is prohibited.

Presenter:

Ahmed Bakhit Salim AL-Shanfari

Ministry of Agriculture, Fisheries, Wealth & Water Resources

Dhofar Governorate, Sultanate of Oman

Experimental Evidence of Plant Thermoregulation and its Implications for Climate Stability

Peter Paul Bunyard
Independent Scientist, UK

Ongoing experiments reveal that plants of different species actively regulate their surface temperature by means of varying their rate of evapotranspiration. The overall cooling under hot weather conditions and bright sunlight may amount to as much as 20 °C. That degree of cooling is vital in order to counteract the relatively low albedo of the leaves and to leave the plant surface cooler than the ambient temperature. In colder, cloudy conditions, plants reduce their evapotranspiration, with resulting surface temperatures that may exceed ambient temperatures. The evolution of angiosperm forests, on account of their vascularised leaves and relatively high rate of transpiration, may have been a major factor in the cooling of the planet from 100 million years ago, when average global surface temperatures were 6 °C higher than today. In addition, a high rate of evapotranspiration will have triggered the inflow of humid air from the ocean, thereby enabling the flourishing of the forests across continents. Physical experiments carried out by the author indicate that water vapour condensation results in partial pressure changes, with resulting airflow, consequently, as physics dictates, cloud condensation over forests will give rise inevitably to ocean-to-continent airflow. Given the role of the forest-derived biotic pump in generating flying rivers over the Amazon Basin, deforestation can result in hydrological collapse. The regeneration and recovery of forests can help cool the Earth's surface by at least 1 °C globally.

Presenter:
Peter Paul Bunyard
Independent Scientist, UK

Proteins of *Pycnoporus sanguineus* have Nematicidal Activity and Induce Resistance to *Meloidogyne* spp. in Micro-Tom Tomato Plants

Olivia Diulen Costa Brito[1], Bruna Caroline Schons[1], Roberto Cecatto Junior[1], Diego Borges Dalevedove[1], Juliana Yuriko Habitzreuter Fujimoto[1] and **José Renato Stangarlin[1]**

Department of Agronomy, Western Paraná State University (UNIOESTE)- Origem Biotecnologia, Brazil

Plant-parasitic nematodes are responsible for significant crop yield losses worldwide, with root-knot nematodes (*Meloidogyne* spp.) being the most relevant group due to their wide host range and global distribution. The search for alternative, sustainable strategies for nematode management has led to growing interest in fungal metabolites and proteins as biocontrol agents.

This study aimed to obtain and characterize protein fractions from the aqueous extract of the basidiomycete *Pycnoporus sanguineus* and evaluate their nematicidal potential and role in resistance induction in *Solanum lycopersicum* cv. Micro-Tom. Proteins were precipitated using ethanol gradients (20%, 40%, 60%, 80%, 95%) and fractionated by gel filtration chromatography (GFC). Six isolated proteins (4.81, 47.98, 0.17, 25.78, 4.25 and 4 kDa) were identified and tested against *Meloidogyne incognita* and *M. javanica*.

In vitro assays demonstrated that both crude aqueous extract and ethanol-protein precipitates exhibited strong nematostatic and nematicidal effects, with up to 100% mortality of second-stage juveniles (J2) of *M. javanica* and *M. incognita*. Resistance induction assays revealed that selected protein fractions (notably proteins II and V) significantly reduced gall formation and nematode reproduction in Micro-Tom roots. Biochemical analyses indicated that these effects were associated with the activation of peroxidase (POX) activity, suggesting an elicitor-mediated plant defense response.

These findings provide evidence that proteins derived from *P. sanguineus* basidiocarps not only exert direct nematicidal activity but also contribute to plant resistance induction. Such dual action highlights their potential as novel biological tools for integrated management of root-knot nematodes in tomato cultivation and possibly other economically important crops.

Presenter:
Olivia Diulen Costa Brito
Western Paraná State University (UNIOESTE)- Origem Biotecnologia, Brazil

Species Composition and Distribution Mapping of *Schleichera oleosa* in Doon Valley of Uttarakhand Himalaya

Ombir Singh[1] and **Pravin Rawat**[2]

[1]Forest Research Institute, Dehradun, India
[2]Himalayan Forest Research Institute, India

Schleichera oleosa (Lour.) Oken, is an important tree species of the lower Western Himalaya. The species is experiencing a population decline due to natural and anthropogenic factors in its natural distribution areas. To assess its current population status and support conservation planning, a study was conducted in the Doon Valley; focusing on species composition, regeneration status and habitat mapping of *S. oloesa*. Vegetation data were collected using stratified random sampling techniques. The relative values of frequency, density and abundance were used to determine the importance value index (IVI) for tree species. To develop a species conservation and management plan, the habitat map of the species was developed using the MaxEnt model. The results of present study showed a total of 177 species belonging to 61 families consisting 89 species of trees, 31 species of shrubs, 37 species of herbs and 20 species of climbers. Fabaceae was the largest family with 5 tree species, 4 shrub species, 1 herb species and 3 species of climbers followed by Asteraceae having 1 tree species, 3 shrub species and 8 herb species. The habitat suitability map developed in this study will facilitate the development of targeted conservation strategies, particularly for vulnerable areas within the forest ecosystem. Present study suggested that, to rehabilitate degraded forest habitats, plantation programs should be initiated in tandem with the development of effective propagation and mass multiplication techniques. Establishing nurseries to produce high-quality planting materials is essential for promoting the successful establishment of *S. oleosa* plantations. Additionally, regular monitoring of the *S. oleosa* population is crucial along with developing suitable propagation methods, raising awareness among local communities and conserving the species through both *in-situ* and *ex-situ* strategies in long term.

Presenter:
Ombir Singh
Forest Research Institute, Dehradun, India

Evaluation of Genetic Diversity and Agronomic Performance of Perennial Ryegrass and Tall Fescue Endophytically Infected by *Neotyphodium* under Tunisian Conditions

Salma Ghariani, Sana Melyane and **Neila Farah-Trifi**

Laboratory of Molecular Genetics, Immunology and Biotechnology, University of Tunis El Manar, Tunisia

The impact of endophyte infection on the agronomic performance of perennial ryegrass (*Lolium perenne*) and tall fescue (*Festuca arundinacea*) was evaluated using wild and cultivated plants either infected or not with *Neotyphodium*. Experimental plants were subjected to nutrient and water treatments.

Although endophyte infection generally enhances the performance of perennial grasses, its effects play an active role either by directly producing alkaloids or by stimulating the synthesis of secondary metabolites in the host plant. These compounds were identified using liquid chromatography coupled with tandem mass spectrometry (LC-ESI-MS/MS).

Neotyphodium infection improves stress tolerance, thereby reducing the need for high proline accumulation, whose quantification showed strong variability among the analyzed accessions.

The interaction between endophytes and perennial grasses is defined as a mutualistic defense. Within this association, the endophyte produces different classes of alkaloids or induces the plant to synthesize secondary metabolites that contribute to protection against herbivores, insects, and nematodes.

Presenter:
Salma Ghariani
University of Tunis El Manar, Tunisia

A Century-Old Coal Company: Hullera Vasco-Leonesa

Leonardo Caruana de las Cagigas[1] and **Julio Tascón Fernández**[2]

[1]Department of Economic Theory and History, University of Granada, Spain
[2]Department of Economics, University of Oviedo, Spain

This paper analyses the historical trajectory of Hullera Vasco-Leonesa, one of the most long-standing firms in Spain's coal mining sector, from its foundation in the late nineteenth century to the later decades of the twentieth century. The study highlights the company's role in driving regional industrialisation and economic development within a sector considered strategic for national energy supply.

The research examines the firm's corporate structure and business strategies alongside the labour conditions of its workforce, offering insight into the social and economic realities of mining communities. It also explores the company's relationship with the Spanish state, emphasising the importance of public intervention, regulation, and subsidies in shaping the evolution of the coal industry. In this context, Hullera Vasco-Leonesa serves as a valuable case study to understand the interaction between private enterprise and state policy in a protected industrial sector.

Furthermore, the paper evaluates the company's capacity to adapt to technological innovation, shifting energy models, and changing political environments across different historical periods. Special attention is paid to its responses to recurrent crises that affected coal mining, highlighting both its resilience and its limitations in the face of structural transformations.

By situating the experience of Hullera Vasco-Leonesa within broader national and international trends, this study provides a representative perspective on the rise, transformation, and gradual decline of coal mining in Spain. The paper contributes to ongoing discussions on industrial change and energy transitions.

Presenter:
Leonardo Caruana de las Cagigas
University of Granada, Spain

Most Appropriate Nozzle of Six-Rotor UAV for Prescribed Spraying Liquid in Tea Plantation under Combined Effects of Downwash Flow Structure

Lin Zhu
Lab of Mechanical Structure & Biomechanics
Anhui Agricultural University, China

Downwash flow structure development has been an important challenge for Unmanned Aerial Vehicle (UAV) to spray tea although the UAV spray is commonly used in crops, dominantly due to the downwash flow structure development in tea plantations more severe than those in crops. Here the UAV spray for tea cultivation is improved through the relationship between nozzle and spraying liquid, or, by choosing the most appropriate nozzle for the prescribed spraying liquid. As a preliminary step, the UAV spray has been studied under effects of downwash flow structure in hover. The six-rotor UAV with four commonly-used nozzles (VP110-02, XR110-02, FPV110-02, and KZ80-04) is used as the representative (Fig.1). Bifenthrin, widely sprayed for tea cultivation, is used as the prescribed spraying liquid. A three-dimensional model of nozzle & flow fragmentation is developed to estimate the nozzle performances. This study demonstrates that nozzle KZ80-04 is the most suitable for Bifenthrin in tea plantation and provides insight into designing effective UAV spray in crops.

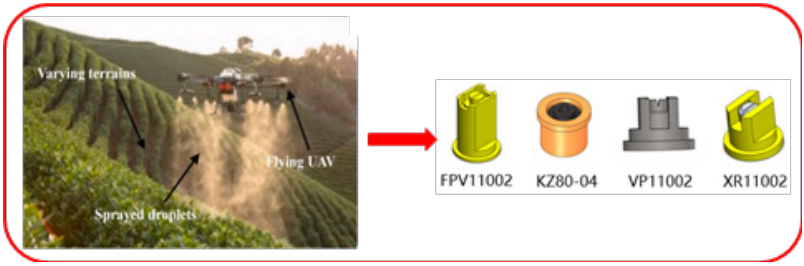

Fig. 1. Six-rotor UAV based spray under different nozzle categories in the Chinese tea plantation

Presenter:
Lin Zhu
Anhui Agricultural University, China

Analysis of Electrolyzer Cell Memory *via* Fractional Calculus and Machine Learning for Efficient Green Hydrogen Production

Silvio T. T. da Silva[1], Denis C. L. Costa[2] and **Marcelo Rodrigues[3]**

[1]Federal University of Pará – UFPA/ITEC/PPGEE, Brazil
[2]Federal Institute of Education, Science and Technology of Pará – IFPA Ananindeua, Brazil
[3]Federal Institute of Education, Science and Technology of Pará – IFPA Belém, Brazil

Global warming produces almost irreversible side effects, as greenhouse gases (GHGs) spread in the atmosphere. Energy production is the most predominant factor in GHG emissions caused by humanity, accounting for 75%, followed by agriculture, with an 18% share, contributing to CO_2, CH_4, and N_2O emissions from crops such as rice, and livestock waste, as well as deforestation, and industry, which emits GHGs from processes such as steel or cement production that are difficult to avoid. The explanation: energy generation is predominantly based on fossil fuels with CO_2 emissions. That is, most of these GHG emissions are anthropogenic emissions, caused by human activities, such as industrial activities, agriculture, transportation, and energy production with fossil fuels. Therefore, this research presents a strategy, based on the integration of Fractional Order Differential Calculus (FODC) with Machine Learning techniques, capable of improving energy transformation, *via* Green Hydrogen, expanding the resolution and quantity of information contained in the analysis of the Proton Exchange Membrane, using the Electrolyzer Cell Memory (Figure 1). The feasibility of the study is associated with the development of more efficient electrolyzers using, for this purpose, the Recognition of Operational Patterns, evidenced by the FODC, enabling a technology on an industrial scale, enhancing the electrolysis of H_2O to produce hydrogen in a more accessible and sustainable way. Through the FODC, it was possible to access the Electrolyzer Cell Memory and highlight a greater amount of information regarding the behavior of the Electrolyzer Cell Voltage, the Thermodynamic Potential, ohmic losses, activation losses, and concentration losses. In this way, a better understanding is gained of the energy consumption in the production of hydrogen for electricity generation and fertilizer production.

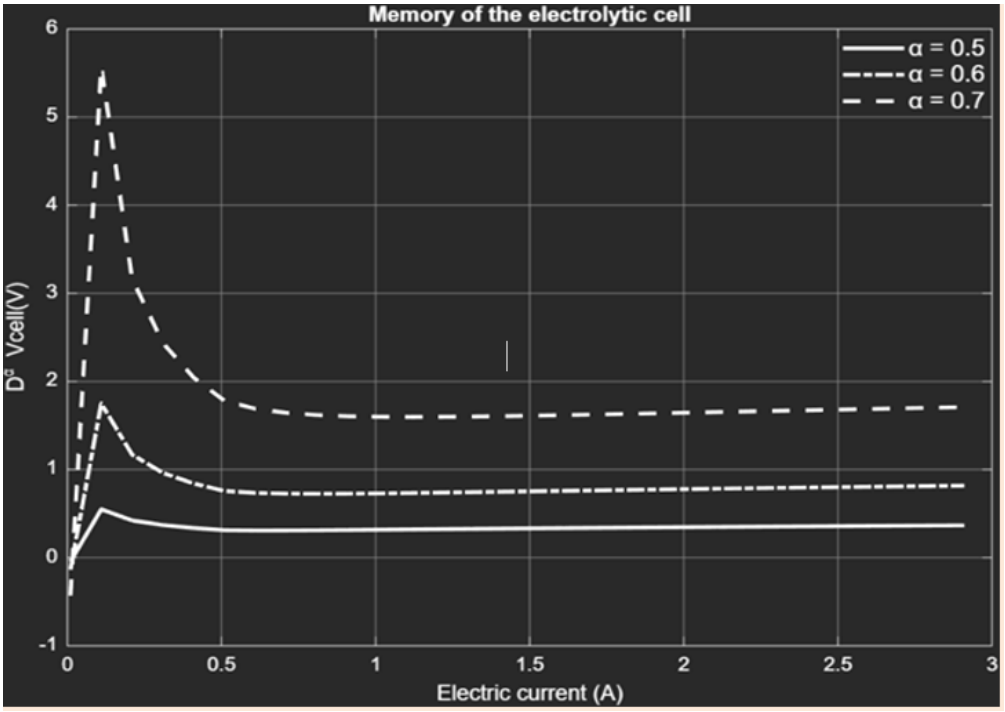

Figure 1: Behavior of the electrolytic cell highlighted by FODC.

Presenter:
Silvio Tadeu Teles da Silva
Federal University of Pará – UFPA/ITEC/PPGEE, Brazil

The Functionality of Starch-Based Straws Combined with Fiber-Based By-Products

Li Guo

Shandong Key Laboratory of Healthy Food Resources Exploration and Creation, Qilu University of Technology (Shandong Academy of Sciences) & School of Food Science and Engineering, China

To develop high-performance degradable starch-based straws and achieve high-value utilization of fiber-based by-products, this study used corn starch as the base material, adding pinewood powder, bamboo powder, peanut shell powder, and coffee grounds powder as four fiber-based by-products. Starch/fiber-based straws were prepared by twin-screw extrusion technology. The effect of the physicochemical properties of the fiber-based by-products on the microscopic structure, thermal stability, wet mechanical properties, water resistance, and biodegradability of starch straws was systematically investigated. The results showed that the physicochemical properties of the four fiber-based by-products varied significantly. Bamboo powder had the highest cellulose content (48.31%) and crystallinity index (49.30%), while coffee grounds powder had the lowest crystallinity index (21.86%) and the finest median particle size (D50=140μm), and was rich in amorphous components such as lignin and fat. Fiber-based by-products formed hydrogen bonds with starch molecules. Bamboo powder and peanut shell powder promoted the ordered arrangement of starch chains. As a result, composite straws made with these materials did not fail during the wet support test in 120 minutes. The swelling degree in 70°C water bath was only 139.32% and 145.67%, respectively, and crystallinity and thermal stability were better than pure starch straws. On the other hand, pinewood powder inhibited the formation of starch crystalline regions. Coffee grounds powder tended to form interface defects. Composite straws made with these materials failed the wet support test in only 57 min and 43 min, respectively, with performance worse than pure starch straws in 74 min. Soil degradation experiments showed that composite straws made with coffee grounds powder degraded by 100% in 45 days of burial, while starch/bamboo powder straws, due to their denser structure, only degraded by 67% in the same period. This study confirmed that bamboo powder was a high-quality filler for improving the structural stability and wet-state performance of starch straws, while coffee grounds powder enhanced biodegradability. The research would provide theoretical and applied support for preparing high-performance degradable starch/fiber-based straws.

Presenter:
Li Guo
Shandong Key Laboratory of Healthy Food Resources Exploration and Creation, Qilu University of Technology (Shandong Academy of Sciences) & School of Food Science and Engineering, China

Lipid-Rich Fraction from *Tristerix corymbosus* Exhibits Potent Antimicrobial Activity against Multidrug-Resistant Bacteria

Maité Rodríguez-Díaz[1], Alejandro A. Hidalgo[2], Sergio A. Bucarey[3], Andres Barriga[4], Sebastian Cumsille-Scandar[2], Alejandro Charmell[2], Nicolas A. Villagra[5], Beatriz Sepúlveda[2], Jorge Escobar[6] and **Jose L. Martínez[7]**

[1]Escuela de Química, Facultad de Ciencias Naturales, Matematica y del Medio Ambiente. Universidad Tecnológica Metropolitana, Chile
[2]Escuela de Química y Farmacia, Facultad de Medicina, Universidad Andres Bello, Chile
[3]Departamento de Ciencias Biológicas, Facultad de Ciencias Veterinarias y Pecuarias, Universidad de Chile, Chile
[4]Centro de Estudios Pará el Desarrollo de la Química (CEPEDEQ), Facultad de Ciencias Químicas y Farmaceuticas, Universidad de Chile, Chile
[5]Departamento de Ciencias Biológicas, Facultad de Ciencias de la Vida, Universidad Andres Bello, Chile
[6]Laboratorio de Química Biológica, Facultad de Ciencias, Pontificia Universidad Católica de Valparaíso, Chile
[7]Departamento de Ingeniería Metalúrgica, Facultad de Ingeniería, Universidad de Santiago de Chile, Chile

The genus Tristerix comprises at least ten species, found from South America. In Chile, several species of these hemiparasitic plants are known as quitral or quintral. Quitral, mainly *T. corymbosus* (syn. *T. tetrandus*) is used in ancestral and alternative medicine for its anti-inflammatory, digestive, hemostatic, hypocholesterolemic, and wound-healing properties. Despite its ethnopharmacological relevance, its antimicrobial mechanisms remain poorly characterized.

Objectives: This study aimed to investigate the phytochemical profile and antimicrobial activity of a hydroalcoholic extract and derived fractions of *T. corymbosus*.

Methods: Leaves and small branches were extracted with 70% ethanol and fractionated by methanol-induced precipitation, yielding a methanol-soluble fraction, a brown hydrosoluble powder fraction, and a residual fraction.

Antimicrobial activity was assessed by agar diffusion and minimum inhibitory concentration assays against reference and clinical multidrug-resistant strains.

Results: The hydrosoluble fraction exhibited the strongest activity, particularly against Gram-positive bacteria including *Staphylococcus aureus*, *Streptococcus pyogenes,* and *Bacillus cereus*, and showed activity against selected Gram-negative isolates such as *Enterobacter cloacae*. Antifungal activity against *Candida albicans* was also observed. LC-MS analysis revealed a predominance of lipidic compounds, including lysophosphatidylcholines, phosphatidylinositols, phosphatidylglycerols, diacylglycerols, and long-chain fatty acid amides. Functional assays using LIVE/DEAD staining demonstrated that over 88% of treated *S. aureus* cells exhibited membrane damage, supporting a membrane-disruptive mechanism (Figure 1).

Conclusion: These findings suggest that amphiphilic lipidic molecules contribute significantly to the antimicrobial effects of *T. corymbosus*, potentially through membrane destabilization. The results provide mechanistic support for the traditional wound-healing use of this species and highlight its potential as a source of bioactive lipid-based antimicrobial agents.

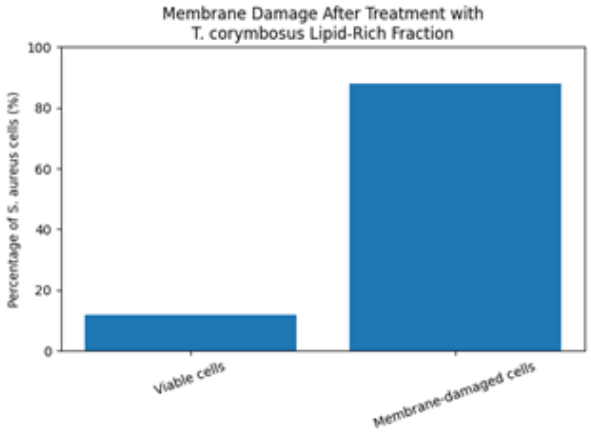

Figure 1. Percentage of viable vs membrane-damaged *S. aureus* cells after treatment with the lipid-rich fraction of *T. corymbosus* (LIVE/DEAD assay).

Presenter:
Maité Rodríguez-Díaz
Universidad Tecnológica Metropolitana, Chile

School Gardens as Sustainable Food and Medicinal Plant Systems in the Verde para Sempre Extractive Reserve: Integrating Plant Science and Traditional Knowledge in the Brazilian Amazon

Ana Paula Simões Castro[1], Daniel Marques da Silva Costa[2] and **Luann Wendel Pereira de Sena[1]**

[1]Federal University of Southern and Southeastern Pará, Brazil
[2]Arandu Educational Ltd, Brazil

Sustainable agriculture in tropical forest regions requires production systems that integrate food security, medicinal plant use, biodiversity conservation, and locally adapted management practices. This study presents and analyzes the *Dona Maria Project*, an applied initiative focused on implementing school gardens as sustainable food and medicinal plant systems in a rural community of the Verde Pará Sempre Extractive Reserve, the largest extractive reserve in Brazil, located in the Amazon, in the municipality of Porto de Moz. The study focuses on a school garden established in a rural public school (Sítia Lopes de Alencar School, Vila Bom Jesus), conceived as a small-scale agricultural system capable of promoting sustainable food production, preserving medicinal plant knowledge, and strengthening traditional land-use practices. The project is based on a consolidated and successful experience developed in collaboration with the school and the local community and supported by an environmental education book collection (*The Adventures of Dona Maria*) and a practical garden kit designed to ensure the establishment and continuity of the garden. A qualitative and participatory methodological approach is adopted within sustainable agriculture and applied plant science frameworks. Data are generated through community dialogues, guided walks, and hands-on agricultural activities involving students, teachers, families, and local knowledge holders. Plant species selection prioritized native and locally recognized food and medicinal plants adapted to regional soil and climatic conditions. Results indicate that the school garden functions as a diversified agricultural system that supports sustainable food production, reinforces traditional agricultural practices, preserves medicinal plant knowledge, and enhances community engagement in biodiversity conservation. The project demonstrates that school gardens can serve as effective tools for sustainable agriculture in extractive reserve contexts, integrating food and medicinal plant systems, traditional knowl-

edge, and environmental education to support food security and long-term sustainability in the Amazon.

Presenter:
Ana Paula Simões Castro
Federal University of Southern and Southeastern Pará, Brazil

Sowers of the Natural World

Aura Maryori Cañón Vargas and **Sandra Patricia Melo Mora**
Santa Librada School, Colombia

School gardens as a research setting for early childhood children to strengthen their environmental awareness and scientific skills.

This project was conceived and executed as a case study in early childhood, given its methodological characteristics and approach. It focused on exploring a pedagogical and research initiative in a real and defined context: a public school in the town of Usme, Bogotá, Colombia. Its main objective was the creation of a school garden to strengthen environmental awareness and develop scientific skills in children. The methodology of the ONDAS program was used, which offers the possibility of putting children at the center of the research by giving them the role of co-researchers. The project was carried out in three phases: (1) Planning, where the research group was formed (22 children and 2 teachers), the need and research question were identified, and the research approach (qualitative) was determined. (2) Development, in which the intervention was designed and implemented, information was collected through the instruments of participant observation, portfolio and survey, and the triangulation of information was performed. (3) Communication, where the children shared their learning at different times and in different spaces. The results of the project showed that the children were able to develop scientific skills such as curiosity, observation, questioning and creating hypotheses, as well as creating possibilities to answer them. They also achieved an important approach to nature, which allowed them to develop an environmental awareness based on the knowledge of different natural processes, the benefits they provide and the significant role that human beings have in the care of the natural environment.

Presenter:
Aura Maryori Cañón Vargas & **Sandra Patricia Melo Mora**
Santa Librada School, Colombia

Physiological Growth of Potato (*Solanum tuberosum* L.) Following Post-Harvest Seed Treatment with 3-decen-2-one (SmartBlock®)

Nomali Ziphorah Ngobese, Julia Kearabilwe Mashishia, Sakies Donald Motene and **Jacques Berner**

Unit for Environmental Sciences and Management, Faculty of Natural and Agricultural Sciences, North-West University South Africa

Seed producers may use transient sprout suppressants during post-harvest storage to control sprouting, allowing growth during field planting. Inadvertent exposure to 3-decen-2-one (SmartBlock®) may occur during commercial storage and handling; however, its long-term effect on seed potatoes is unknown. This study aimed to determine the dose effect of SmartBlock® on the emergence percentage and growth of potatoes in a controlled environment (completely randomized design with three replicates). 'Mnandi' and 'Vanderplank' seed potatoes with sprouts less than 3 mm were stored in 9 L plastic containers and treated with 0.100 and 0.135 mL/kg SmartBlock®dosages, compared to a control. Emergence percentage, plant height, leaf area, stomatal conductance, CO_2 assimilation, chlorophyll, transpiration rate, stem number and diameter, and tuber number and weight were measured. At the high dosage (0.135 mL/kg), emergence percentage significantly reduced ($p < 0.05$) in Mnandi cultivar compared to the control. Therefore, this indicated that SmartBlock® can delay and reduce emergence depending on a dosage applied, as no significant interaction between treatment and cultivar was observed. SmartBlock® significantly ($p < 0.05$) reduced stomatal conductance, CO_2 assimilation, and tuber weight, with effects observed at specific dosages and differing among cultivars. However, no significant treatment and cultivar interaction was detected. These results suggest that SmartBlock® may influence photosynthetic processes and yield components in a limited manner, with some variation between cultivars.

Presenter:
Nomali Ziphorah Ngobese
North-West University, South Africa

Effect of Climate Change on Energy Security in Sub-Saharan Africa: The Role of Renewable Energy Adoption

L.-F. Dunyoh[1,2], F. S. Adiku[3] and **C. K. Teye[3]**

[1]Department of Sciences, Jasikan College of Education, Ghana
[2]University of Professional Studies, Ghana
[3]Finance Department, University of Professional Studies, Ghana

This study examined the effects of climate change on energy security in Sub-Saharan Africa and investigated whether the adoption of renewable energy moderates this relationship. The study focussed on Sub-Saharan Africa, using balanced panel data for 20 countries covering the period, 2000–2022. Data was analysed using Panel-Corrected Standard Errors regression, to account for heteroskedasticity and cross-sectional dependence. The findings revealed that climate change exerts a significant negative effect on energy security, while renewable energy adoption enhances energy security and significantly moderates the impact of climate change on energy security. Marginal analysis further indicated, that when renewable energy adoption exceeds the threshold value, adverse effect of climate change becomes neutral or positive as shown in Fig. 2 below:

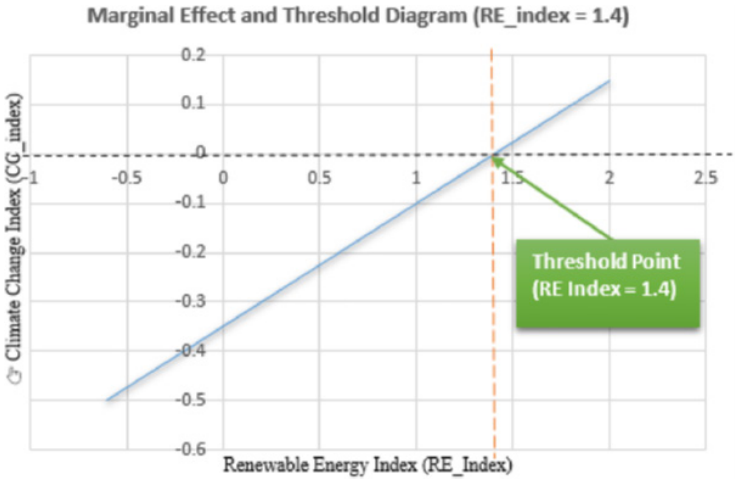

Fig.2: Marginal effect of climate change on energy security with renewable energy threshold (RE_index = 1.4). Source; Authors' computation, 2025.

This implies that, increasing renewable energy adoption diminishes, and eventually reverses the negative impact of climate change on energy security. The study then postulates that, climate change may have a positive impact on energy security in regions where there are high levels of renewable energy adoption. From the foregoing, and in the context of this Conference, the argument then arises as to whether Plant Science has a major role to play in boosting renewable energy adoption in Sub-Saharan Africa, in accordance with UN Sustainable Development Goals (SDG) 7&13 which prescribe sustainable & clean energy for all and climate action respectively.

Presenter:
Lord-Freeman Dunyoh
Jasikan College of Education, Ghana
University of Professional Studies, Ghana

Genetic Diversity of Phyllosphere Microbiome as a Bioindicator of Urban Air Pollution

Mahwish Batool Kazmi[1,2] and **Tahir Naqqash**[1]

[1]Institute of Molecular Biology and Biotechnology
Bahauddin Zakariya University, Pakistan
[2]Department of Biochemistry & Biotechnology
The Women University, Pakistan

Urban air pollution in megacities like Lahore, Multan and Faisalabad frequently exceeds World Health Organization guidelines, driven by vehicular and industrial emissions, posing significant health risks to vulnerable populations. From November 2022 to February 2023, the average concentration of major air pollutants including particulate matter (PM2.5, PM10), ground level ozone (O_3), carbon monoxide (CO), methane (CH_4), volatile organic carbon (VOC), hydrogen sulphide (H_2S), sulfur dioxide (SO_2), oxides of nitrogen (NO_x), ammonia (NH_3) in ambient air were recorded using a calibrated Aeroqual Series 500 sampler at high-traffic sites across these cities. This study tested the hypothesis that phyllospheric microbes inhabiting leaf surfaces of roadside plants adapts to high pollution levels and may serve as bio-indicators of urban air quality. A total of 287 bacterial isolates from 42 plant species were collected across eight sampling locations and genetically characterized based on conserved repetitive DNA sequences dispersed throughout the bacterial genome-using Rep-PCR (BOX, ERIC, REP primers) to assess microbial diversity and conserved repetitive DNA sequences. Results showed high genetic polymorphism (94.7–98.0%) and distinct clustering (8–38 clusters per city) patterns, with REP-PCR showing the highest discriminatory power (Simpson's Index: 0.938–0.976). Certain plants species such as *Ficus benjamina, Phoenix dactylifera* and *Euphorbia milii* hosted the most diverse microbial communities, particularly in heavily polluted areas such as Lahore, where strains exhibited up to 62 bands. Principal component analysis further confirmed that genetic linkages were influenced by pollution stress, with REP and BOX primers accounting for the maximum variance. Pearson correlation analysis indicated a strong positive correlation ($p< 0.05$) between all air pollutants except O_3 at all sites. These findings suggest a correlation between phyllosphere microbial diversity and the intensity of air pollution, with pollution-tolerant plants supporting stress-adapted microbes. This study highlighted the potential of phyllosphere microbes as bioindicators for monitoring urban air quality, offering a novel and cost-effective tool for environmental assessment. Furthermore, metagenomic profiling could

further elucidate microbial functions for optimizing environmental management in polluted megacities.

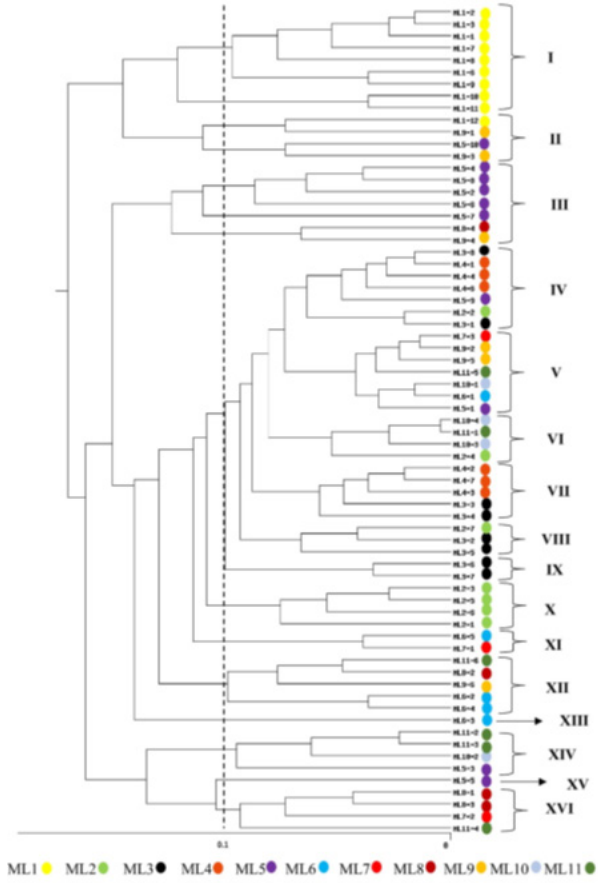

Fig. Dendrogram of phyllosphere isolates derived from REP-PCR genotypic patterns from various plants collected from Old Bus Stand Walled area and Town Hall, LHR. Different colors denotes different roadside plants of LHR. Two major clusters with 16 sub-clusters labelled from I to XVI showing Clusters I, III, IX, X containing 9, 7, 2, and 4 strains showing strong plant-specific clustering.

Presenter:
Mahwish Batool Kazmi
Institute of Molecular Biology and Biotechnology
Bahauddin Zakariya University, Pakistan
The Women University, Pakistan

An Alternative Technique to Produce a New Low Alcohol Wine

Barbara la Gatta

Department of Sciences of Agriculture, Food, Natural Resources, and Engineering (DAFNE), University of Foggia, Italy

Climate changes and the increase in the number of consumers who limit their alcohol intake are having a profound effect on the wine market. In particular, we have been witnessing an unexpected phenomenon regarding oenology. Global warming created two phenomena for this sector: (i) planting grapes even in regions where they traditionally did not grow; (ii) a sugar content in grape so high to achieve significant alcohol levels, which often exceed 14% (v/v). These outcomes led to the production of too much wine, unmanageable by the market and the impossibility for the consumer to recognize the features of a product, because the high alcohol content changes its sensory features. Dealcoholisation techniques have high performance, but with a heavy impact on the composition of the wine, especially on the concentration of the fixed constituents and aromatic profile. Therefore, a valid and sustainable alternative to dealcoholisation methods, such as modified distillation systems, were performed by optimising techniques that reduce the content of fermentable sugars in the must without manipulating the final product. In detail, it was chosen a pre-fermentation technique with the glucose oxidase (GOX) enzyme for the production a low-alcohol wine. Results showed a decrease in alcohol production of approximately 50 % through the refinement of an innovative

Presenter:
Barbara la Gatta
University of Foggia, Italy

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SPEAKER TALKS

Explorating PGPRs and Green Synthesized Nanoformulations in Mitigating Diseases of Soybean and Productivity Enhancement in India

Shamarao Jahagirdar[1], Kavanashree K[1], Brunda K S[1], Vivekanand K. Karagi[1], D.N. Kambrekar[2], Gurudatt Hegde[1], P. U. Krishnaraj[3], M. S. Patil[1] and **G. T. Basavaraja[4]**

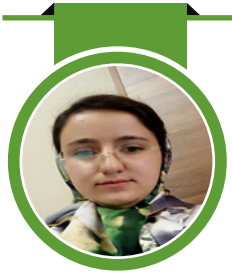
[1]Professor of Plant Pathology & Head, University Placement Cell And Former Dean & Head of the Institute, PAJANCOA and RI, Department of Plant Pathology, University of Agricultural Sciences, India
[2]Department of Agricultural Entomology, University of Agricultural Sciences, India
[3]Department of Agricultural Microbiology, University of Agricultural Sciences, India
[4]Rtd.AICRP on Soybean, University of Agricultural Sciences, India

The major constraints in soybean production are climate, rainfall, edaphic factors, biotic and abiotic stresses. Soil borne fungal pathogens are the major stumbling block in successful cultivation of soybean in recent years in India. Over the year's chemical management of the plant diseases has posed a greater threat to the Indian agriculture by the development of new races of the pathogens, pesticidal residues and environmental hazards. In this context, use of biological control is gaining importance to protect the environment and soil health. Endophytes and green nano particles have emerged as a new innovative and sustainable approach to manage the diseases, abiotic stresses and to promote plant growth. Nanotechnology is an approach that deals with the reduction of bulk material into nano size that ranges between 0.1 to 100nm. Richard Philips Feynman introduced the concept of nanotechnology in 1959 and Professor Norio Taniguchi coined the term. Nano agriculture has become a trend in researchers to promote application of non-toxic metal based and green nanoparticles in crop production and plant protection and thus, nanotechnology has scope and application in agriculture production (Khan and Rizvi, 2014). Risks involved in chemical management strategies has led to an era to explore new management strategies of which nanotechnology is gaining scope in management of disease as well as in detection of the pathogen. Nanoparticles can be synthesised through physical and chemical methods (Iravani *et al*., 2014), wherein microbial and plant extracts can be used (Mittal *et al*., 2013).

The benefits of native endophytes have been recognized over the past ten years from around the world and many interesting research have been undertaken. In India, though there is research on fungal endophytes, the potentiality of endophytes in suppressing soil borne pathogens remained as untapped resources. Hence, with a view of exploiting the native endophytes and their role in suppression of soil borne pathogens of soybean, the present investigation was undertaken. The work green synthesis of nano particles and their effect against anthracnose of soybean is the first report from India. Nanoscience, an emerging technology in the field of phytopathology was explored to manage the anthracnose disease of soybean caused by *Colletotrichum truncatum*. The results are of study are discussed as below. Thirty fungal endophytes were isolated from major soybean growing areas of northern Karnataka and Maharashtra. Out of which eight effective fungal endophytes were obtained by *in vitro* screening against major soil-borne pathogens *viz*., *Sclerotium rolfsii, Rhizoctonia bataticola* and *Fusarium oxysporum*. The fungal endophytes RF-BV-3 (46.46%), SF-DM-8 (49.15%) were effective against *S. rolfsii*, and the isolate SF-DM-8 (49.32%) was effective against *R. bataticola*. The effective fungal endophytes against *F. oxysporum* were RF-BV-3 (66.61%), SF-BV-3 (59.66%), SF-DM-8 (69.21%), SF-DS-10 (56.49%), LF-HH-5 (66.31%), LF-DM-10 (59.78%), LF-DD-13 (61.15%) and LF-KK-14 (59.78%). Based molecular methods, the effective fungal endophytes were identified as *Daldinia eschscholtzi* (RF-BV-3), *Fusarium solani* (SF-BV-3 & LF-KK-14), *Neofusicoccum parvum* (SF-DM-8), *Diaporthe phaseolorum* (SF-DS-10 & LF-HH-5), *Phomopsis* sp. (LF-DM-10) and *Colletotrichum aenigma* (LF-DD-13). The antagonistic effect of 30 bacterial endophytes of soybean collected from northern Karnataka and parts of Maharashtra against *Sclerotium rolfsii, Rhizoctonia bataticola* and *Fusarium oxysprum* were assayed *in vitro* through dual culture plate technique. The bacterial endophytes RB-KK-6 (40.78 %), SB-BS-6 (50.08 %) and LB-BU-1 (47.02 %) were found effective against *S. rolfsii* and the isolates SB-DG-11 (47.41 %), LB-BiN-8 (41.22 %) were effective against *R. bataticola*. The effective bacterial endophytes against *F. oxysporum* were RB-HS-1 (41.99 %), SB-BiJ-9 (40.07 %), LB-BU-1 (54.20 %) and LB-BV-2 (51.64 %). Based on molecular characterization the effective bacterial endophytes were identified as *Acinetobacter* sp. (RB-HS-1), *Alcaligenes faecalis* (RB-KK-6), *Stenotrophomonas* sp. (SB-BiJ-9), *Bacillus pumilus* (SB- DG-11 & LB-BiN-8), *Paenalcaligenes* sp. (LB-BU-1), *Bacillus cereus* (SB-BS-6) and *Brevibacillus* sp. (LB-BV-2). Among all the endophytes evaluated to assess their antagonistic potentiality and understanding of mechanism of disease suppression, the best inhibition was noticed in *Neofusicoccum parvum* against all the tested pathogens ranging from 69.41 to 82.35 per cent by production of volatile compounds. *Neofusicoccum parvum* and *Daldinia eschscholzii* showed positive results for siderophore production and zinc solubilisation.

Neofusicoccum parvum, *Daldinia eschscholzii* and *Colletotrichum aenigma* showed positive results for HCN production test. For chitinase test only *Neofusicoccum parvum* was found to be positive. *Neofusicoccum parvum* and *Colletotrichum aenigma* were recorded positive for phosphate solubilization. The study was conducted to assess the effectiveness of four green synthesized nano formulations *viz*., chitosan-based zinc nano formulation (ChZnNF), *Pseudomonas fluorescens* based zinc nano formulation (PfZnNF), pomegranate aril-based sulphur nano formulation (PASNF) and pomegranate aril-based silver nano formulation (PAAgNF) at different concentrations under *in vitro* and glasshouse conditions. The results are in conformity Srikanth (2018) and Supriya (2019) in pulse crop against fungal pathogen. *Bacillus subtilis* based zinc nanoparticle and chitosan based zinc nanoparticle at 1250 ppm concentration effective in managing citrus canker and bacterial wilt of tomato respectively (Vinay *et al*., 2016).Phytotoxicity of green synthesized nanoformulation It was observed under the study that ChZnNF and PfZnNF along with precursor did not show any phytotoxicity upto 2000 ppm. PASNF, sodium thiosulphate, showed toxicity with symptoms such as scorching, curling and drying of leaves. PAAgNF did not show any toxicity up to 500 ppm concentration. Toxicity to the extent of 20 per cent was observed at 15 days after spray of 1000 ppm of PAAgNF. Precursor of PAAgNF, silver nitrate showed toxicity up to 20 per cent from 10 days after spray. Toxicity symptoms observed were tip scorching and veinal chlorosis (Fig 10). Phytotoxicity of precursor and non-phytotoxicity of the nanoparticles in case of sulphur and silver was also recorded by Supriya (2019). Similarly, non-phytotoxicity of silver nanoparticles was reported by Vanti *et al*. (2018). Confirmation of nanoparticles on sprayed leaves FESEM performed by selecting the treated leaves, showed the presence of the respective nanoparticle, whereas, in the control there was no record of nanoparticle present. Entophytes and green synthesized PAAgNF can be explored as a novel technology in managing soybean diseases and productivity enhancement of soybean in India.

Presenter:
Shamarao Jahagirdar
University of Agricultural Sciences, India



Shilajit versus Placebo in the Management of Patients with Moderate Coronavirus

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The virus is a global health threat, a pandemic, and causes severe acute respiratory syndrome. It is highly transmissible and belongs to the family *Coronaviridae* and the family *Coronavirinae*, whose members infect a large host of viruses and cause symptoms and illnesses ranging from the common cold to severe and ultimately fatal diseases.

This phase 3 parallel-group triple-blind randomized controlled trial will be conducted on 110 patients with a documented diagnosis of COVID-19 in the COVID ward of the Bohlool Gonabadi Hospital, Gonabad, Iran. Randomization will be done using the permuted block randomization approach with variable sizes. Participants in the intervention group will receive 100 mg Shilajit (two 500 mg capsules) per day, while the control group will receive placebo capsules for two weeks. Study outcomes include clinical improvement at day 14 of the intervention. Therefore, the presence of cough, headache, sore throat, chills, smell disorder, myalgia, axillary temperature, and SPO_2: FiO_2 ratio will be recorded at baseline and day 14 of the intervention for patients in both groups.

Therefore, this study aims to provide high-quality evidence regarding the efficacy of Shilajit on COVID-19 symptoms in patients with mild to moderate COVID-19. The findings of this study will help clinicians and healthcare professionals decide whether to use or add Shilajit to the routine medication for COVID-19 in ambulatory patients with mild to moderate COVID-19. As Shilajit is a local product and can be easily produced, and due to the old history of using this herbal medicine in the population, it is estimated that the population would well accept Shilajit. Shilajit could be used by healthcare providers to manage the disease better and to increase patient adherence to routine medications.

Presenter:
Royanama Rahimi
Mashhad University of Medical Sciences, Iran

Effects of Dopamine on Reducing Salt Stress Damage in Pepper (*Capsicum annuum* L.) at Morphological, Physiological, Biochemical and Molecular Levels

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Salinity is a major environmental problem that significantly reduces agricultural productivity, and excessive salt accumulation in the soil negatively affects plant growth, physiological functions, and biological processes. Dopamine, a catecholamine neurotransmitter, is considered important as a potential regulator of plant stress responses. This study aimed to investigate the effects of exogenous dopamine on salt stress tolerance in pepper (*Capsicum annuum* L.) by examining morphological, physiological, biochemical, and molecular responses. Pepper seedlings were subjected to 100 mM NaCl stress and treated with dopamine at concentrations of 50, 100, and 200 µM. Dopamine application, particularly at 100 µM and 200 µM concentrations, significantly improved plant growth parameters, including height, stem diameter, leaf area, and biomass accumulation. It enhanced photosynthetic efficiency by increasing chlorophyll content, stomatal conductance, and transpiration rate, while reducing oxidative stress markers such as H_2O_2 and MDA. Dopamine also regulated the activity of antioxidant enzymes (SOD, CAT, and POD) and maintained ion homeostasis by reducing sodium (Na^+) and chloride (Cl^-) accumulation and promoting potassium (K^+) and calcium (Ca^{2+}) uptake. At the molecular level, dopamine influenced the expression of genes involved in ion transport (AKT1, HKT2;1, and HKT2;2) and photosynthesis. This study demonstrates that dopamine is a promising plant growth regulator that enhances salt tolerance in pepper plants. It achieves this by

improving growth, photosynthetic efficiency, antioxidant defense, and ion homeostasis, while modulating key molecular pathways. Our findings suggest that dopamine can be used as a sustainable strategy to reduce salt stress and increase crop yields in salt-affected agricultural regions. However, further research is needed regarding its application in other plants and field conditions.

Presenter:
Ertan YILDIRIM
Atatürk University, Türkiye

Mikrobiota of Plants in Metal Polluted Environments

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Soil contamination with heavy metals has substantial ecological consequences, including alterations in soil physicochemical properties and disruption of plant-associated microbiota. These microbial communities play an important role in plant responses to abiotic stress; however, their composition and ecological dynamics under metal stress remain insufficiently characterized. In this study, *Arabidopsis arenosa*, a pseudo-metallophyte inhabiting both polluted and unpolluted environments, was used to investigate microbiota assembly under heavy metal stress and the role of soil properties in shaping microbial communities. Plant and soil samples were collected from sites in Poland, Slovakia, and Austria representing contrasting levels of contamination. Soil physicochemical parameters and metal concentrations were determined, and contamination levels were classified using established frameworks and integrated into a cumulative contamination index. Microbial DNA from roots, leaves, and soil was subjected to high-throughput sequencing targeting bacterial (16S rRNA, V5–V7) and fungal (ITS1) markers. Alpha diversity analyses revealed differences in microbial richness between contamination levels, whereas beta diversity analyses demonstrated a clear separation of microbial communities along the contamination gradient, identifying metal contamination as a primary driver of microbiota structure. Despite these shifts, the core microbiome remained relatively stable across environments, and observed differences were predominantly driven by the depletion of low-abundance taxa under metal stress. Comparative analyses of soil and plant-associated microbiota indicated that metal contamination did not substantially alter the environmental pool of microorganisms but

instead reshaped plant-associated communities through host-mediated selection. This effect was particularly pronounced in root-associated microbiota, where significant compositional shifts occurred without major changes in overall richness. Notably, selected fungal taxa, including representatives of *Agaricomycetes*, exhibited reduced abundance under metal stress, suggesting their sensitivity to toxic metals, whereas taxa enriched in contaminated environments are likely associated with stress tolerance. Together, these findings indicate that microbiota assembly under metal stress is governed by the interplay between environmental filtering-primarily affecting rare taxa-and host-driven selection processes that modulate plant-microbe interactions.

Presenter:
Oleksandra Kutinova
Jagiellonian University, Poland

Review of Phytoplasmas Associated with Grapevine Yellows in Georgia

Iveta Megrelishvili[1], Nino Maziashvili[1], Tinatin Elbakidze[2], Zurab Khidesheli[1] and **Fabio Quaglino[3]**

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Georgia is one of the primary centers of *Vitis vinifera* domestication and maintains a rich and diverse grapevine germplasm comprising over 500 autochthonous cultivars. Recent investigations have revealed distinct genetic identity and potential tolerance to major grapevine pathogens of this gene pool. Among these, grapevine yellows (GY) diseases, principally “flavescence dorée" represent severe threats to viticulture worldwide. Surveys conducted in Georgian vineyards documented for the first time the presence of ‘Candidatus Phytoplasma solani’ (BN-associated phytoplasma) in both grapevines and Convolvulus arvensis, whereas the “flavescence dorée” phytoplasma was not detected. Molecular characterization revealed high genetic diversity among ‘Ca. P. solani’ strains, mainly linked to the bindweed-related pathosystem, which exhibited severe symptoms and yield loss. Subsequent large-scale surveys identified phytoplasmas belonging to the 16SrV group in Georgian vineyards, likely introduced through imported propagation material. Complementary field trials in Piedmont (northwestern Italy), a region heavily infected by “flavescence dorée”, demonstrated that several Georgian cultivars infected by the “flavescence dorée” phytoplasma (genotype M54) exhibited mild or no symptoms (Fig. 1).

The unique genetic diversity and reduced susceptibility of Georgian *V. vinifera* varieties to GY make this germplasm a valuable genetic resource for breeding programs aimed at enhancing phytoplasma tolerance while maintaining high oenological quality.

The implementation of mandatory certification of grapevine planting materials produced in Georgia (since 2024) and the application of sensitive molecular diagnostic tools will be crucial to prevent phytoplasma spread and ensure the production of healthy nursery stock.

"This work was supported by Shota Rustaveli National Science Foundation of Georgia (SRNSFG) [FR-23-1133]"

Figure 1. Georgian varieties of *V. vinifera* with grapevine yellows infections

Presenter:
Iveta Megrelishvili
LEPL Scientific-Research Center of Agriculture, Georgia

Distribution of Viral Infection in Georgian Varieties of *Vitis vinifera*

Zurab Khidesheli, Iveta Megrelishvili, Nino Maziashvili and **Levan Ujmajuridze**

LEPL Scientific Research Center of Agriculture, Georgia

Grapevine viral diseases are widespread throughout the world and cause serious damage to viticultural regions. Viral infections are spread by planting material and vector insects, and their control is extremely relevant for many viticultural countries Grapevine viral diseases are widespread in almost all regions of Georgia, but the Kakheti region is characterized by the greatest prevalence.

The aim of the study was investigate the distribution of viral infection in economically important Georgian grapevine varieties: “Saperavi”, "Rkatsiteli“, “Tamaris vazi”, “Tsitska”, “Aleksandrouli”, “Shavkapito”, “Goruli mtsvane”,”Chinuri”, “Meskhuri mtsvane” located in mother stock and collections in the Kartli and Kakheti regions for further selection of virus-free material in Georgia (Fig.1)

Two different methods by means of Triple and Double Antibody Sandwich-Enzyme linked Immunosorbent Assay (DAS- ELISA, TAS –ELISA) using monoclonal and polyclonal antibodies and TaqMan® triplex real-time PCR.

Using TaqMan®MGB™ probes (Applied Biosystems) were used to detect 6 types of viral infections: Grapevine Fanleaf Virus(GFLV), Grapevine Fleck Virus (GFkV), Grapevine Leaf Roll Virus-1 (GLRaV-1), Grapevine Leaf Roll Virus-2 (GLRaV-2), Grapevine Leaf Roll Virus-3 (GLRaV-3) and Grapevine Virus A (GVA), Arabic Mosaic Virus (ArMV), Grapevine Virus B(GVB).

The results showed that different types of viral infections were accumulated in 39.49% of tested samples. Among viral pathogens tested ArMV (3.21%) and GVA (3.66%) were in minority. GLRaV-1, 2, 3, GFLV and GFkV virus presence, respectively: 18.04%, 24.68% and 21.26% in collected samples was high compared to others, whereas GVB virus was not found.

It should be noted that in the same samples were found mixed infections (2 or 3 types of viruses), particularly 19.8% of patterns were containing GFLV and GFkV viruses and 21.9% GLRaV-1, 2, 3 mixes.

Regular sampling and testing of all vines has provided virus free propagation material in Jighaura and Mukhrani grafted nurseries in Kartli region of Georgia.

Figure 1. Different symptoms of virus infection in Georgian Vineyards

"This work was supported by Shota Rustaveli National Science Foundation of Georgia (SRNSFG) [FR-23-1133]"

Presenter:
Zurab Kidesheli
LEPL Scientific Research Center of Agriculture, Georgia

Sensitivity of Georgian *Vitis vinifera* L. Varieties to Grapevine Yellows Diseases

Nino Maziashvili[1], Tinatin Elbakidze[2], Iveta Megrelishvili[1], Zurab Khidesheli[1] and **Fabio Quaglino[3]**

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Grapevine yellows (GY) constitute a complex of diseases characterized by common symptoms associated with FD phytoplasma (FDp), and bois noir (BN), associated with '*Candidatus* phytoplasma solani' (CaPsol), cause huge losses in grape production.

Due to the high genetic variability between their associated phytoplasmas, FD and BN have different epidemiological patterns: FD is highly epidemic (FDp is transmitted vine-to-vine by the ampelophagous vector Scaphoideus titanus), while BN is slowly epidemic (CaPsol is transmitted from weeds to vine by the polyphagous vector Hyalesthes obsoletus, and vine is a CaPsol dead-end host). Unfortunately, up to now no *Vitis vinifera* varieties were reported as resistant to phytoplasmas. During field surveys in the eastern part of Georgia, including Kakheti (Kondoli, Napareuli, Tsinandali villages) and Kartli (Jigaura and Mukhrani villages) regions, carried out from 2019 to 2025, typical GY symptoms were observed in both Georgian and international varieties (Fig.1).

The susceptibility of 12 selected Georgian varieties to FD and BN (CaPsol) were tested using TaqMan® triplex real-time PCR using TaqMan®MGB™ probes (Applied Biosystems) in addition Nested PCR were used to detect different 16SrV phytoplasma strains, including FD-associated phytoplasmas, and BN phytoplasma from the 16SrXII-A subgroup.

Based on the results obtained in this study, the presence of BN and 16SrV phytoplasmas was confirmed using two molecular methods in the eastern part of Georgia.

Interestingly, the results highlighted the first detection of 16SrV phytoplasmas in 11 grapevine varieties in mother stock and collection vineyards and four varieties in commercial vineyards. Monitoring of GY phytoplasma infec-

tions should be continued using molecular techniques like triplex real -time PCR.

Data from these studies highlighted that most Georgian varieties are less susceptible to phytoplasmas associated with diseases of the GY complex and indicating tolerance to the infection.

Further investigations are needed to study their molecular interactions with GY phytoplasmas, and to identify the genetic traits related to their low susceptibility.

"This work was supported by Shota Rustaveli National Science Foundation of Georgia (SRNSFG) [FR-23-1133]"

Figure 1. Symptoms of phytoplasmas associated with grapevine yellows in Georgia

Presenter:
Nino Maziashvili
LEPL Scientific-Research Center of Agriculture, Georgia

Rapid Dereplication of Trunk Bark Constituents of *Croton sylvaticus* and Molecular Docking of Terpenoids from Three Congolese *Croton* Species

Bienvenu Kamalandua Mvingu[1], Tienabe Nsiama[1], Obed Nsemi Kanga[1], Kalulu Muzele Taba[1], Jason Thambwe Kilembe[1], Jean-Noël Kanyinda Mputu[1,2], Sarah Garifo[2], Céline Henoumont[2], Dya Fita Dibwe[1,3], Blaise Mavinga Mbala[1] and **Sophie Laurent[2]**

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[2]NMR and Molecular Imaging Laboratory, General, Organic and Biomedical Chemistry Unit, University of Mons, Belgium
[3]Faculty of Health Sciences, Hokkaido University, Japan

Phytochemical investigation and bioactivity evaluation of terpenoids from the Croton species were conducted. The chemical composition of C. sylvaticus was explored using chemical phytochemical screening techniques and dereplication of 13C NMR data using MixONat software (v. 1.0.1). Natural products with diverse structural features were identified in the dichloromethane extract of trunk bark. These include monoterpenoids, sesquiterpenoids, diterpenoids, triterpenoids, along with other minor metabolites, such as steroids, saponins, and fatty acids. Further purification of this extract led to the isolation of three major secondary metabolites, acetyl aleuritolic acid, caryophyllene oxide, and phytol. These secondary metabolites were reported for the first time in C. sylvaticus. The isolated compounds were structurally compared to known anticancer terpenoids previously identified in two other Congolese Croton species. Through molecular docking studies, the predicted binding affinities of the identified compounds were assessed, and possible structure–activity relationships (SAR) were proposed. Two structurally characterized receptors—the human androgen receptor (HAR, PDB ID: 1E3G) and hypoxia-inducible factor 1-alpha (HIF-1α, PDB ID: 3KCX), known for their involvement in cancer-related pathways, were used for molecular docking investigations. Among the tested compounds, 1, 2, 3, and 12 were identified as having strong-to-moderate predicted binding affinities to both protein targets, along with favorable drug-like properties according to the ADMET analysis. This investigation could justify the use of Croton plants in traditional medicine. In addition, our study highlights the potential of the Congolese Croton species as sources of bioactive secondary metabolites.

Presenter:
Bienvenu Mvingu Kamalandua
Université de Kinshasa, Democratic Republic of the Congov

Ameliorative Effects of Strigolactone on Tolerance to Lead Stress on Lettuce (*Lactuca sativa* L.) Plants

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Soil contamination by heavy metals, particularly lead (Pb), the second-most-toxic metal, poses serious risks to plants and humans due to its accumulation from various anthropogenic activities. Even at low concentrations, Pb accumulation negatively impacts plant morphology, physiology, and biochemical processes, leading to a range of structural and functional disorders. Strigolactones (SLs) are a novel class of terpenoid lactones that play a vital role in regulating plant growth and development, particularly under stress conditions. The study examined the impact of varying exogenous SL concentrations (0, 10, and 20 µM) on plant growth and various physiological, biochemical, and molecular factors in lettuce under lead stress [using $Pb(NO_3)_2$ at 0 and 300 ppm]. The results revealed that Pb stress adversely affected plant growth, while SL treatments improved growth under both control and Pb-stress conditions. While Pb stress increased electrical leakage (EL), malondialdehyde (MDA), and hydrogen peroxide (H_2O_2), SL applications reduced these levels. Chlorophyll content decreased under Pb stress, but this reduction was alleviated by SL supplementation. Pb treatment also increases the activities of several antioxidant enzymes, including superoxide dismutase (SOD), catalase (CAT), peroxidase (POD), ascorbate peroxidase (APX), glutathione reductase (GR), glutathione S-transferase (GST), glucose-6-phosphate dehydrogenase (G6PD), and 6-phosphogluconate dehydrogenase (6GPD). SL applications significantly increased antioxidant

enzyme activities under both normal and Pb-stress conditions. However, Pb-stressed plants had lower nitrate reductase activity (NRA) than control plants, whereas SL treatments increased NRA compared with non-treatments. The content of other nutrients except Pb decreased significantly in lettuce seedlings grown under Pb stress. External SL applications increased the uptake of these nutrients, especially under Pb stress. The mRNA expression analysis showed that SL treatment, Pb stress, and their combination affected the expression levels of *LsABCC3, LsCCD7, LsCCD8, LsD14, LsD27, LsHMA2, LsMAPK, LsMAX1,* and *LsMAX2*. Only Pb stress significantly decreased gene expression, particularly *LsCCD8* and *LsD14*, in both tissues. The combined Pb and SL treatment significantly increased *LsMAX2* expression in both tissues by about 3-fold. These results suggest that SL applications play an essential role in helping plants survive in harsh environments.

Presenter:
Esma Yigider
Atatürk University, Türkiye

Ameliorative Effect of Humic Substances on Physiological and Morphological Responses of Lettuce (*Lactuca sativa* L.) under Flooding Stress

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The increasing effect of global climate change, particularly the increase in heavy rainfall and subsequent flooding, pose an important threat to plant productivity and economic losses. Herein was evaluated the ameliorative potential of humic substances (humic and fulvic acid) in the adverse effects of flooding stress on lettuce (*Lactuca sativa* L.). The effects of humic acid and fulvic acid application to plants were investigated in terms of morphological, physiological, biochemical, and plant mineral content. The study, conducted in a greenhouse as a pot experiment, was designed with 3 replicates for each treatment, and 6 plants per replicate. The plants were subjected to waterlogging stress for 10 days. Flooding significantly reduced plant height, plant diameter, stem diameter, fresh and dry weight of plants, fresh and dry weight of roots, chlorophyll (a, b, and total) content, and mineral content in lettuce plants. However, humic acid and fuvic acid had a positive effect under both normal and stress conditions, increasing these parameters compared to the control and mitigating flooding damage. Furthermore, increases in H2O2, MDA, proline, and antioxidant enzyme activity in stressed plants varied with humic substances. The study showed that humic substances were effective in reducing the effects of flooding stress and promoting plant growth. Both humic acid and fuvic acid had similar effects and could be used to increase tolerance to flooding stress.

Presenter:
Melek Ekinci
Atatürk University, Türkiye

Inhibitory Effect of Exogenous Methionine on Drought Stress in Tomato Seedlings

Murat Aydin[1], Melek Ekinci[2], Selda Ors Cırık[3], Ertan Yıldırım[2], Sümeyra Ucar[4], Esra Yaprak[4], Metin Turan[5], Esma Yiğider[1], Aysegul Kasapoğlu[4] and **Daniel Rodriguez Leal[6]**

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Drought is one of the most frequently discussed issues that poses a threat to the future of the world, especially because of the damage it causes to agricultural production. Researchers are working on alternatives for areas and situations where water is scarce in crop production. One of these is exogenous plant treatments. Methionine has also recently begun to be used for this purpose. In this study, which investigated the effects of different doses of methionine, an amino acid, on plant growth and development in water-deficient tomato seedlings, solutions prepared in 3 doses as 0, 10 mg/L and 20 mg/L were applied as sprays to the leaves, and the plants were irrigated at 100% of the field capacity (control) and 60% of the field capacity to create drought stress. Water stress reduced plant height, stem diameter, and leaf area by 22%, 5%, and 32%, respectively, while methionine application showed higher values for these parameters under both normal and water stress conditions. Water stress also reduced plant fresh weight, root fresh weight, plant dry weight, and root dry weight by 38%, 8%, 32%, and 5%, respectively. Methionine application increased these parameters, but the decrease under stress was less pronounced. In the study, water stress increased H_2O_2, MDA, proline, and sucrose contents, and CAT, POD, and SOD enzyme activities, while these parameters varied with methionine applications. Furthermore, methionine application under drought stress resulted in increased expression levels of

the *SISOD, SIHKT1.1, SIPR1, SILOX1, SIWRKY8, SIWRKY31, SIP5CS,* and *SICAT* genes in tomato shoot tissue compared to controls. The study results indicate that methionine may play an important role in providing water stress tolerance, and its effectiveness varies among doses. It is thought that further studies are needed to detail the mechanism of action.

Presenter:
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Comprehensive Population Analysis in the System of Studying and Conserving the Biodiversity of Forest Ecosystems

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Populations represent one of the fundamental levels of biological organization and constitute the actual form of species existence. Accordingly, identifying the specific features and regularities of population functioning is important for both fundamental and applied research, including the development of principles of sustainable natural resource use, approaches to maintaining ecosystem stability, and effective conservation strategies.

The aim of this publication is to present the results of an assessment of the state of populations of three species – *Ledum palustre* L. (7 populations studied), *Chimaphila umbellata* (L.) W. Barton (9 populations), and *Oxycoccus palustris* Pers. (6 populations) – within the territory of Ukrainian Polissia. The study was conducted using standard methodologies for determining the area of population fields, population density (number of plants per unit area), and population structure (ontogenetic and vitality structure).

It was found that the population field of *Chimaphila umbellata* is usually limited in extent (up to 22 m^2), whereas in *Ledum palustre* and *Oxycoccus palustris* it may comprise several hectares. In *Ledum palustre*, population density generally does not exceed 10 plants/m^2, while in *Oxycoccus palustris* it may reach approximately 500 plants/m^2. Subsenile and senile individuals are typically absent from the populations of all three species. In most populations, pre-generative plants form a dominant or substantial proportion (33.3-90.6%). For all species, populations representing three vitality types (depressive, balanced, and prosperous) were identified, although their frequency differs among plant species. Of the seven populations of *Ledum palustre*, three were classified as depressive and three as prosperous. Among the nine populations of *Chimaphila umbellata*, four were balanced and four prosperous. Of the six populations of *Oxycoccus palustris*, two were depressive and three balanced.

Overall, based on the comprehensive population analysis, the most favorable conditions for the formation and stable functioning of populations were identified as follows: for *Chimaphila umbellate* – the community *Pinetum*

(sylvestris) franguloso (alni)–vaccinioso (myrtilli)–pleuroziosum (schreberi); for *Ledum palustre – Pineto (sylvestris)–Betuletum (pendulae) vaccinioso (myrtilli)–ledosum (palustris)*; and for *Oxycoccus palustris – Sphagnetum (cuspidati) eriophorosum (vaginati)*. On the basis of the identified population states, a set of measures aimed at improving the effectiveness of conservation of these species has been proposed.

Presenter:
Maryna Sherstiuk
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