UNITED Scientific Group
A non-profit organization

2nd International Conference on

Plant Science & Research (Virtual)

November 02-03, 2020

Plant-2020

Oral Presentations

Extracts from Cornel officinalis e alleviates cognitive deficits and senescence status by inhibiting Alzheimer's disease-type pathologies and necroptosis in SAMP8 mice

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Abstract

Aging is associated with the deterioration of memory and higher incidence of neurodegenerative disorders, such as Alzheimer's disease (AD). Senescence-accelerated mouse-prone 8 (SAMP8) is a murine model of accelerated aging. The aim of the present study was to investigate the effects of cornel iridoid glycoside (CIG), an active ingredient extracted from Cornus officinalis, on AD-type pathologies in SAMP8 mice at different ages (6, 10, and 14 months old). Consistent with previous studies, SAMP8 mice showed AD-type pathologies including cognitive impairment, neuronal and synapse loss, APP amyloidogenic processing and tau hyperphosphorylation. In addition, we found increased necroptosis in SAMP8 mice.

CIG treatment for 2 months alleviated the cognitive impairment, retarded aging process, and increased the lifespan, prevented neuronal and synapse loss, increased the expression levels of synaptophysin, synapsin I, PSD-95, GluR1 and p-CamKIIα. CIG treatment also increased protein levels of sAPPα, ADAM10 and IDE, decreased tau phosphorylation at Thr205 and Ser396 sites. Moreover, CIG decreased the level of RIPK1, oligomer of p-MLKL, monomer and oligomer of MLKL indicating the possible role of CIG on inhibiting the activated necroptosis in the brain of SAMP8 mice.

After comparing the effects of CIG between three treatment tranches, we inferred that early CIG interventions showed better beneficial effects on alleviating cognitive deficits and AD-type pathologies. For aged SAMP8 mice at 14 month-old, CIG retarded senescence status, indicating potential advantage in the treatment for aging-related neurodegenerative diseases. Overall, these results suggested that CIG might be beneficial to the treatment of aging-related neurodegenerative diseases, such as AD.

Biography

Denglei Ma, M.D., graduated from Capital Medical University, joint Ph.D. student of New York State Institute for Basic Research. Dr. Ma is currently assistant researcher at department of pharmacy, Xuanwu Hospital of Capital Medical University. He is mainly engaged in the development of drugs for the common diseases of the nervous system and the elderly, focusing on the drug research and the pathogenesis of neurodegenerative diseases, such as Alzheimer's disease. He has published over 15 original articles and participated in several pre-clinical drug researches on new drugs and national major projects.

Water-Wisteria as an ideal plant to study heterophylly in higher aquatic plants

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Abstract

Plants show morphological differences in leaf form in response to changes in the surrounding environment, a phenomenon called heterophylly. Heterophylly provides an ideal process to understand mechanisms by which plants adapt their growth to withstand ecological changes. We found that the aquatic plant Water-Wisteria, Hygrophila difformis (Acanthaceae) is an ideal model for heterophylly study due to its obvious leaf features, sensitivity to environment, and convenience in culture, propagation and gene transformation. Genome and anatomy of Hygrophila difformis were also studied.

We further found that expression of KNOTTED1-LIKE HOMEOBOX (KNOX1) orthologs, the genes that regulate leaf morphogenesis and development, are correlated with environmental changes as well as with different leaf forms. Gibberellin (GA) and cytokinin (CK) signaling, regulated by KNOX1, is also correlated with leaf forms. We propose that the KNOX1, GA and CK regulatory module controls the heterophylly transition. Variations in leaf form in response to environmental factors were dissected. Endogenous hormone levels, exogenous hormones and inhibitors application, qRT-PCR, in situ hybridization, reporter gene assays were carried on to reveal the mechanism in heterophylly development.

Biography

Hongwei Hou is a Professor and Leader of Aquatic Plant Physiology Group. Obtained Ph.D. degree from the Department of Plant Molecular and Developmental Biology at Peking University in 2004. He did his visiting studies at the University of Lethbridge, the University of Toronto, and at research centers of Agriculture and Agri-food Canada before returning to China in 2014. Past research focuses include genes involved in leaf and nitrogen-fixing nodules development in Arabidopsis thaliana and Lotus japonicus. Current researches focus on aquatic plant in morphogenesis, biodiversity evolution, ecology and application.

Potential of Entomopathogenic Fungi on the Biocontrol of Sap-Sucking Pests

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Abstract

Entomopathogenic fungi are considered great biological control agents to control many important and fierce insect pests from tree defoliators to trunk borers. Among them, plant sap-sucking insect pests posed great damage to various plants growth. Entomopathogenic fungi showed great potential on sap-sucking insect pests by their unique infecting mechanism of directly passing through insects' integument. We tested potential of two important entomopathogenic fungi Isaria fumosorosea and Beauveria bassiana against multiple sap-sucking insects including Jacobiasca formosana Paoli (Hemiptera: Cicadellidae); Aphis gossypii Glover (Hemiptera: Aphididae); Bemisia tabaci Gennadius (Hemiptera: Aleyrodidae) and Stephanitis nashi Esaki et Takeya (Hemiptera: Tingidae). Laboratory bioassay showed the fungal stain Ifu 13a had good pathogenicity to the multiple insect pests, and the insects' mortality was closely related to the fungal conidia concentration inoculated. Median lethal concentration dosages (LC50) were calculated as 3.9 × 103, 6.8 × 104, 3.0 × 104 and 6.9 × 105 conidia/ml against J. formosana, A. gossypii, B. tabaci and S. nashi, respectively. B.bassiana strain Bb202 showed more excellent pathogenicity than Ifu 13a. The LC50 values of concentrations 1x105, 1x106, 1x107, 1x108 conidial ml-1 were calculated for the M. persicae, J. formoseana, B. tabaci and S. nashi and determined as 6.7x104, 1.3x106, 3.6x106 and 1.2x107 conidia ml-1, respectively. Field trials in greenhouse and open field were conducted to control the sap-sucking insect A.gossypii and A.gossypii respectively. A wonderful control efficiency was observed in each trial.

Key words: Entomopathogenic fungi, Sap-Sucking Pests, Isaria fumosorosea, Beauveria bassiana

Biography

Dr. Bin WANG, Professor at Anhui Agricultural University, P.R.China. Enotomologist & Fungal microbiologist. Research focuses on Biological Control of Insect Pests, Study and Application of Entomopathogenic Fungi, Mass Production of Fungal Pesticides. Published more than 50 scientific papers and rewarded the State/Provincial Science and Technology Awards six times.

Plant Growth Promoting Bacteria: Effective Tools to Improve Crop Health, Yield and Quality Parameters

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Abstract

Agriculture has been, and will continue to be the backbone of food availability and food security. It directly sustains livelihood of about two-third of population, and is the lifeline of agroindustries. As the world population is increasing, food availability has to be increased accordingly to meet out the increasing food demand. The current world population of 7.6 billion and is expected to reach 8.6 billion in 2030 and 9.8 billion in 2050. Therefore, use of agro-chemicals has become important to sustain the agriculture production and fulfill the food requirement of all human beings worldwide. Unfortunately, irrespective and irrelevant use of the chemicals is posing harmful effects in declining the soil fertility and contamination of surface and groundwater, eventually leading to deteriorating the health of agroecosystem. Traces of such chemicals have also been reported to be deposited in agricultural produce that may cause serious health problems in human beings. Considering such facts, organic farming is being promoted worldwide to strengthen agroecosystem, soil health, biodiversity, and biological activities in soil. Use of plant growth promoting bacteria (PGPB) is one of the most important components and are known to enhance nutrient availability, plant growth and yield to maintain sustainable agriculture.

In view of the above, we are focused to promote the use of native PGPB strains (Azotobacter chroococcum, Bacillus subtilis, B. pumilus, Pseudomonas fluorescens and P. putida) to enhance yield and nutritive quality of the agricultural crops under organic cultivation. Well characterized characterized strains are used (seed bacterization or root treatment) to assess their potential in different crops to affect crop yield and nutritive quality of the produce. Being important nutrient source, use of these PGPBs along with organic manures has also been validated.

In our studies on different crops, we found that seed bacterization or root treatment of plants with PGPBs in combination with organic manures could significantly enhance crop health, yield and nutritive quality even under field conditions. We found that PGPB application could enhance the amino acid, protein and antioxidant potential of the specific crop (details will be presented). Principal component analysis revealed a positive correlation between soil nutrients and their uptake by host plants. Our studies showed that PGPBs could increase the crop yield and simultaneously significant residual amounts of nutrients (NPK) remain available in soil even after harvesting the crop. These residual amounts of nutrients will be available to the next crop and thus will reduce the input cost. This suggests that PGPBs help in releasing the nutrients sustainably and can contribute towards achieving the goal of sustainable agriculture and soil health. Simultaneously, higher nutrients and antioxidant potential of the produce is important in health point of view of the consumers and may therefore help the farmers to get higher price of his produce.

Biography

Yogesh Kumar Negi has his expertise in 'Plant-Microbe' interaction with a particular interest in the development of bioinoculants for small farm agriculture in Uttarakhand Himalaya in India. In a decade of his research, over 500 farmers are benefitted with site specific bioinoculants. Bacillus spp. and Pseudomonas fluorescence are his choice of organisms for the development of effective formulations. With a vast work on plant growth promotion and disease management, his current focus in on enhancing the nutritive quality of the crops using the microbial friends.

Arbuscular Mycorrhizal Symbiosis: Current and Future Generation Technology For Abiotic Stress Management and Sustainable Agriculture

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Abstract

Arbuscular mycorrhizal fungi (AMF) represent a monophyletic fungal lineage (Glomeromycota) that benefits terrestrial ecosystems worldwide by establishing an intimate association with the roots of 90% land plants: the mycorrhizal symbiosis. This relationship

results in improved nutrient acquisition in exchange for photosynthetically fixed carbon. In recent years, AMF have gained attention of scientists as a bioremediator due to their ability to survive in degraded soils by synthesizing glycoproteins, organic acids, etc and improving growth and productivity in plants. Mechanisms underlying the protective roles of AMF include compartmentalization of toxic ions in cell vacuoles, altering osmolyte and carbohydrate metabolism as well as transcript levels of genes involved in stress responses. In the light of this, different experiments have been conducted in my lab to understand mechanisms underlying the role of various AMF species in modulating soil properties and imparting redox homeostasis in legumes. AMF improved soil enzyme activities as well as establishment of rhizobial symbiosis by improving nutrient uptake and strengthening glutathione as well as asada cycle under metal, salt stress. Moreover, our studies indicated the existence of functional diversity among AMF species, as different combinations of host plant and AMF had different impacts on the morphology, nutritional status, symbiotic efficiency and gene expression patterns in the symbiosis. In addition, comparisons between the effectiveness of native AMF species versus exotic ones have also been carried out. Conclusively, AMF could be regarded as a promising strategy for abiotic stress management and maintenance of balanced agro-ecosystem.

Keywords: Abiotic stresses, Arbuscular mycorrhizal fungi, Asada-halliwal cycle, functional diversity, legumes, soil properties

Biography

Neera Garg completed her PhD in Botany (Plant Physiology) from Panjab University, Chandigarh, India. She is working as Professor for the last 10 years in the Depatment of Botany, Panjab University, Chandigarh, India. Her area of research includes abiotic stress induced responses in legumes and their bioremediation by arbuscular mycorrhiza. She has published more than 100 papers in reputed journals and has been serving as reviewer of reputed International journals.

Acknowledgement: The author is grateful to The Department of Biotechnology (DBT), Ministry of Science and Technology, Government of India for providing financial assistance.

The effect of endophytic bacteria on in vitro shoot growth of Prunus yedoensis and its identification.

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Abstract

Tissue cultures of Prunus yedoensis, a famous ornamental tree species, are important to mass-propagate true-to-type plants. Within in vitro cultures, bacterial contamination of explants hinders the propagation of sustainable cultures. Negative effects of endophytic bacteria vary from leaf yellowing to shoot-tip necrosis, ultimately resulting in shoot death. Explants with an overgrowth of endophytic bacteria on basal parts showed inferior growth than explants with no bacterial growth. Shoot growth and contamination became severe as the shoots were subcultured. Two endophytic bacteria, Pantoea spp. and Curtobacterium spp., were identified from the in vitro shoots using 16S rRNA gene sequences. Bacterial susceptibility to antibiotics was screened using different antibiotics. Two antibiotics, cefotaxime and tetracycline, effectively controlled bacteria growth. Although both antibiotics killed the bacteria, tetracycline adversely affected plant growth by reducing shoot growth. A broad range of cefotaxime concentrations had no toxic effects to the in vitro plants. However, concentrations between 50 and 150 mg/L showed no difference in eliminating bacteria. Shoot growth, induction, and elongation were greater in a medium supplemented with cefotaxime compared with a control (without antibiotics) and a medium amended with tetracycline.

Biography

Eun Ju Cheong is an Assistant Professor, Kangwon National University, College of Forest and Environmental Sciences, Davison of Forest Sciences. She is also a Horticulturist, USDA, Agricultural Research Service, Beltsville Area, National Germplasm Resources Lab. And also a Research Analyst/Visiting Scientist, Oregon State University/US National Arboretum, Floral and Nursery Plant Research Unit

Zinc Uptake of Bread Wheat is Induced under Iron Deficiency

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Abstract

The present study aimed to test the contribution of the iron (Fe) deficiency-induced uptake system to zinc (Zn) and copper (Cu) uptake by using bread wheat (Triticum aestivum cv. Bezostaja). For this purpose, two different uptake experiments, long-term and short-term, were set up in a nutrient solution culture under controlled growth chamber conditions. For the long-term experiment, wheat cv. plants were grown with different concentrations of Fe or Zn. Results show that there was an uptake system induced under Fe-limiting conditions which also contributed to Zn and Cu uptake. However, the Zn deficiency-induced uptake mechanism affected neither Fe nor Cu uptake by wheat. Short-term uptake experiments indicate that Fe deficiency-induced Zn2+ uptake was more enhanced than the absorption of Zn-phytosiderophore (PS) complexes. In addition, the Fe-deficient plants absorbed more Zn in comparison to those plants supplied with sufficient Fe. Similar tendencies in Zn uptake under Fe deficiency in both short- and long-term experiments suggest that there may be a specific Fe uptake system induced under Fe-limiting conditions for non-chelated metals in bread wheat. Moreover, this system also contributes to the transport of inorganic forms of some other metals, such as Zn and Cu. Although evidence is still needed involving the use of molecular biological techniques, it is hypothesized that IRT-like proteins are responsible for this uptake system. Moreover, the release of Fe deficiency-induced phytosiderophores and uptake of Fe(III)-phytosiderophore complexes may not be the only mechanisms involved in the adaptation of wheat to Fe-limiting conditions.

Biography

Emin Bulent Erenoglu completed his BSc in Agriculture (Soil Science) in 1991, he defensed MSc in Soil Chemistry and Fertility at Çukurova University, Adana-Turkey in 1995. Thereafter, in 2002, he finished his PhD (Physiological Differences in the Response of Cereals to Zinc Deficiency) in Plant Nutrition and Physiology at Hohenheim University, Stuttgart-Germany. From 2002 to 2005, He did Post Doc at the same institute in Molecular Biology. Since 2005, he is working as lecturer and researcher at Çukurova University. At the same time, he works as consulting at the biggest fertilizer production company of Turkey for 5 years.

Prooxidant and Antioxidant Properties of Betula etnensis Rafin Bark Extracts

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Abstract

Betula species contain several bioactive compounds such as flavonoids, tannins and pentacyclic triterpenoids as betulinic acid, which might have multiple biological activities. Betula etnensis Rafin also known as Birch of Etna is a deciduous tree belonging to the Betulaceae family. It is a legacy of the last glaciation in Sicily and it grows only on Etna volcano, at an altitude between 1000 and 2000 m. The bark is cream-coloured and rich, in particular the young branches, of numerous peltate resinous glands. Our studies showed that B. etnensis bark extracts possess considerable polyphenols content and radical scavenging activity and interesting reducing power and also exhibit a significant ability to differently modulate oxidative stress in an in vitro model of colon cancer, leading to cell death by inducing ferroptosis. Moreover, we investigated the effects of the bark alcoholic extract in streptozotocin-induced diabetic rats. The extract administration significantly ameliorated the diabetes-related conditions induced by streptozotocin treatment, compared with untreated diabetic animals. Furthermore, oxidative stress markers particularly, lipid hydroperoxides and nitrite/nitrate levels, non-proteic thiol groups, γ-glutamyl-cysteine-synthetase activities and expression, heme oxygenase-1, endothelial and inducible nitric oxide synthases expression were markedly restored both in plasma and tissues. The phytocomplex present in the bark displays, in distinct experimental models, a range of prooxidant and antioxidant properties by the regulation of the redox homeostasis through the modulation of some regulatory enzymes that are involved in the cellular oxidative balance. Concluding, B. etnensis potentially represents a safe source of novel nutraceuticals for use in the prevention of oxidative stress-related diseases.

Biography

Giuseppe Antonio Malfa is a Professor of Plant and Animal Biology and Pharmaceutical Biology at the University of Catania. He did his Ph.D., in University of Catania and Sapienza University of Rome. He is involved in the study of natural substances with antioxidant activity and their therapeutic use, in the characterization of biological activity and mechanisms of action of plant drugs and natural substances and in the identification of active ingredients in natural extracts; He is author of several scientific papers in referred Journals and chapters in international books. He has invited speaker of International and World Congresses and reviewer of several International Scientific Journals.

Assessment of vitamin C and anthocyanin content of lettuce germplasm (Lactuca spp.)

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Abstract

Among the leafy vegetables, lettuce (Lactuca sativa L.) is the most consumed in the world though the most popular varieties have a low nutritional value. That encouraged us to quantify the vitamin C and anthocyanin contents in commercial and traditional varieties, but also in lettuce wild relatives.

Higher concentrations of ascorbic (AA), dehydroascorbic (DHAA) and total ascorbic (TAA) acids were present in wild species and traditional varieties, when compared to commercial varieties. The wild relatives showed up to 13%, 20% and 45% more AA, DHAA and TTA, respectively, than the commercial varieties. Traditional varieties contained similar amount of DHAA, but 11% and 8% more AA and TAA than the commercial lettuces. In contrast, commercial varieties accumulated six and eight times more anthocyanins than traditional varieties and the wild relatives, respectively. Interestingly, green varieties contained significantly higher amounts of vitamin C in all its forms than red varieties (15% more DHAA and 18% more AA and TAA). Cyanidin 3-O-(6'-O-malonylglucoside) was found in most samples, becoming the most abundant anthocyanin (98.31%), whereas peonidin 3-O-glucoside was a minor anthocyanin, only present in cultivated lettuces, and cyanidin 3-(6''-acetylglucoside) was exclusively found in the stem of a wild Lactuca.

The richest and the intermediate groups in vitamin C concentration were mainly formed by wild relatives and traditional varieties, whereas the group with the highest amount of total anthocyanins was exclusively formed by red commercial varieties. This could be useful for consumers, as well as breeders aimed to increase the content of health-promoting compounds in lettuce.

Biography

Aurora Díaz obtained the European PhD in Genetic Breeding and Engineering at the Spanish National Research Council (CSIC). She completed two postdoctoral stays in the UK, at National Institute of Agricultural Botany (Cambridge) and John Innes Centre (Norwich) working on genetics and molecular biology in cereals. Then, she focused on the genetic control of domestication and traits of agronomic interest in melon at the Institute for Plant Molecular and Cellular Biology (CSIC, Spain).

She holds a tenure as Agricultural Researcher at Agrifood Research and Technology Centre of Aragon (CITA, Spain), leading two projects aimed at the biofortification of lettuce.

Terahertz Sensing in the era of Precision Agriculture

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Abstract

Climate change has swiftly brought into many burning issues to the limelight, out of which conservation of water is by far the most important. Agriculture accounts for 70% of water usage worldwide, and at the same time it has profound effects in the event of water constraints such as drought. Terahertz sensing of plants has recently emerged as a significant tool to monitor the water stress of plant leaves. In this talk, we present our over-arching vision of smart agriculture, in which the health of plants is assessed non-invasively by monitoring the leaf water content. Specifically, the transmission spectrum of the leaves in the frequency range of 0.75 to 1.1 THz is used to characterize the water content. We deduce that a plant increasingly become transparent to THz waves as the days pass. The knowledge gained then can be used to implement efficient irrigation systems resulting in conservation of water, which is indeed a pressing issue in the times we live.

Biography

Qammer H. Abbasi, received his BSc and MSc degree in electronics and telecommunication engineering from University of Engineering and Technology (UET), Lahore, Pakistan (with distinction). He received his Ph.D. degree in Electronic and Electrical engineering from Queen Mary University of London (QMUL), U.K., in Jan., 2012. From 2012 to June 2012, he was Post-Doctoral Research Assistant in Antenna and Electromagnetics group, QMUL, UK. From 2012 to 2013, he was international young scientist under National Science Foundation China (NSFC), and Assistant Professor in University of Engineering and Technology (UET), KSK, Lahore. From August, 2013 to April 2017 he was with the Center for Remote healthcare Technology and Wireless Research Group, Department of Electrical and Computer Engineering, Texas A &M University (TAMUQ) initially as an Assistant Research Scientist and later was promoted to an Associate Research Scientist and Visiting lecture where he was leading multiple Qatar national research foundation grants (worth £3.5 million). Currently Dr. Abbasi is a Lecturer (Assistant Professor) in University of Glasgow in the School of Engineering in addition to Visiting Lecturer (Assistant Professor) with Queen Mary, University of London (QMUL) and Visiting Associate Research Scientist with Texas A & M University (TAMUQ).

He has been mentoring several undergraduate, graduate students and postdocs. Dr. Abbasi has research portfolio of around $3 million and contributed to a patent, 5 books and more than 200 leading international technical journal and peer reviewed conference papers and received several recognitions for his research. Dr. Abbasi became IEEE senior member at the age of 29 and was Chair of IEEE young professional affinity group. He is an Associate editor for IEEE Access journal and acted as a guest editor for numerous special issues in top notch journals. He is a member of IET and commitee member for IET Antenna & Propagation and healthcare network. Dr. Abbasi has been a member of the technical program committees of several IEEE flagship conferences and technical reviewer for several IEEE and top notch journals. He contributed in organizing several IEEE conferences, workshop and special sessions in addition to European school of antenna course.

Biological Control of Ornamental Plant Pests

A.D. Ali[1]

A.D. Ali, Davey Institute, The Davey Tree Expert Company, USA

Abstract

Urban plants are infested by pests of all types including aphids, thrips, mealybugs and many others. Urbanization provides opportunities for dramatic changes in the abundance of native and exotic herbivorous arthropods. Reasons for outbreaks include habitat fragmentation and the urban 'heat island effect' that increases both plant stress and pest developmental rates. Currently, pest management for urban plants is largely accomplished by the application of pesticides, often made on a calendar basis. While chemical pesticides undoubtedly provide necessary tools to manage many pest problems, overreliance on this approach has caused several problems including: 1) insecticide resistance; 2) resurgence of pest populations due to elimination of beneficial species; and 3) removal of pesticides from the marketplace.

This presentation will provide findings from a 6-year study conducted to evaluate the efficacy and economics of alternative pest management programs. Results obtained demonstrate that the use of beneficial arthropods can provide not only successful pest suppression, but also is economically comparable to the traditional use of chemical insecticides. Pest identification and monitoring

as well as identification and release of beneficial agents will be discussed. Successful cases of control of aphids, thrips, mites and mealybugs will be presented.

Biography

Dr. Ali has over 30 years of experience in the Green Industry. He supervises all training and technical support programs for Davey offices throughout the US and Canada. He is an Entomologist by training, a Board-Certified Master Arborist, TRAQ qualified, and served on the Board of Directors and as President of the Florida Chapter, International Society of Arboriculture. Dr. Ali has written a book on Pest Management in the Landscape. In addition, he has presented 130 scientific and training seminars, attended 135 conferences, workshops and symposia and authored more than 300 scientific and popular-oriented articles.

Coexistance is the main mode of plant relationships in modern biotopes

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Abstract

Understanding the mechanisms that form relationships between plants in modern biotopes is one of the priority problems of theoretical and experimental biology, especially under the forecast of climate global changed. We came to the conclusion that coexistence of species, not competing for resources, is the main mode of complicated interrelations of plants in modern phytocenoses, which exist throughout the history of mankind. Inorganic resources needed for photosynthesis and respiration as sun light, carbon dioxide and oxygen in atmosphere are unlimited. Plants are the first link that combines inorganic and organic worlds and underlies the further trophic chains of heterotrophic organisms in the biosphere. Our views are concordant with the ideas about positive species interactions and species complementarity based on the experimental research, which facilitate the organization and productivity of plant natural communities. Coexistence (facilitation, complementarity) of plants in phytocenoses is conditioned by the biological peculiarities of cenotic types, namely by differences in life (morphological) forms and types of root systems, duration of ontogenesis, reproduction systems, sequence of seasonal development as well as the level of adaptive phenotypic plasticity in response to various environmental fluctuations, climatic, seasonal and meteorological, including adverse changes. Range of plasticity reflects the ecological and biological peculiarities of the species that make biocenoses, their different attitude to the environment, to each other, their dynamics or inertia. Just coexistence of species different on biology and ecology provides stability of phytocenoses and, thus, stability of the plant cover, without which life of the planet Earth is impossible.

Biography

Elizabeth L. Kordyum is Head of the Department of Cell Biology and Anatomy of the Institute of Botany of the National Academy of Sciences of Ukraine. She has Experience of 27 years as Head of the section “Space Biology, Biotechnology and Medicine” of the Council on Space Research of NAS of Ukraine. Her major Fields of Scientific Research: plant embryology and cell biology, space and gravitational biology, experimental botany, responses and adaptation of plants to abiotic stresses. She was Awarded by National Academy of Astronautids for the book “Plants in Space”, in 2011 and in 2020 – She was Awarded by International Astronautical Federation “Hall of Fame”

Single-cell type proteomics and metabolomics of guard cell immunity and CO2 response

Sixue Chen

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Abstract

Human population is expected to reach 9 billion by 2050, and global crop productivity needs to increase by 70% to feed the growing

population. Unfortunately, pathogen infection and other adverse environmental conditions have posed grand challenges to crop yield and food security. Stomatal pores are major entry points of bacteria pathogens. How stomatal guard cells respond to pathogen invasion and other environmental factors is an important and interesting question. Recently, we have developed a new redox proteomics method called cysTMTRAQ. This method has been applied to discover potential redox proteins in stomatal guard cells in response to the flagellin's N-terminal domain's 22-aa peptide (flg22) of Pseudomonas syringae pv. tomato str. DC3000 (PstDC3000). Stomatal closure was observed within 5 minutes of the flg22 treatment and became significant after 15 minutes of treatment. Reactive oxygen species (ROS) levels increased throughout the time course of treatment, and reached the peak at 15 minutes. Based on these results, three time points (15, 30 and 60 minutes) were selected for the cysTMTRAQ experiments. A total of 2144 proteins were identified, 677 contained cysteines with cysTMT labels, and 57 showed significant redox changes ($q < 0.05$) after flg22 treatment. Here I report the functional characterization of a lipid transfer protein in in guard cell innate immunity. As CO2 levels affect stomatal immunity and stomatal movement, we studied CO2 signaling using hyphenated metabolomics technologies. A new signaling pathway involving jasmonic acid was discovered. Future directions in signal crosstalk and data integration will be discussed.

Biography

Professor Sixue Chen completed his Ph.D. study in plant biochemistry in China, and postdoctoral research in Germany, Denmark and University of Pennsylvania, USA. He is a Professor in Department of Biology, and Faculty Director of Proteomics and Mass Spectrometry at Interdisciplinary Center for Biotechnology Research of University of Florida. Dr. Chen has established three major research projects: plant guard cell hormone, disease and CO2 signaling, glucosinolate metabolism, and transition from C3 to CAM photosynthesis. Dr. Chen serves as Associate Editors and Board Members of Metabolomics, Frontiers in Plant Proteomics, Journal of Proteomics and other journals.

Plant-Derived Bioactive Compounds Which Poison Grazing Livestock

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Abstract

Toxic plants often poison grazing livestock. This results in large economic losses to farmers and local communities due to animal deaths, increased management costs, and the underutilization of productive rangelands. The relative composition, chirality, and concentration of bioactive plant compounds affects the toxic potential of poisonous plants. For example, differences in Delphinium (larkspur) spp. toxicity are due plant norditerpene alkaloid composition (chemotype) and the biogeographical distribution of plant chemotypes with some chemotypes significantly more toxic to grazing animals than others. Piperidine alkaloids like coniine from Conium maculatum (poison hemlock) are toxic to livestock in a concentration- and enantiomer- dependent manner. These differences in composition, chirality, and concentration of bioactive compounds in poisonous plants impacts the biological responses of livestock to these compounds. As a result, the management of livestock on pastures containing poisonous plants must centered upon both plant and animal factors which impact plant toxicity.

Biography

Benedict (Ben) Green received his Ph.D. in Molecular Veterinary Biosciences from the University of Minnesota. He is a Research Pharmacologist at the Poisonous Plant Research Laboratory, and an Adjunct Assistant Professor in the department of Animal, Dairy and Veterinary Sciences at Utah State University in Logan, Utah. Dr. Green's basic research focus is on the mechanism of action of plant-derived bioactive compounds in livestock and the metabolism and detoxification of those compounds. His applied research is aimed at understanding how animal factors such as animal; sex, age, and breed contribute to plant toxicity in livestock.

Management of Staining and Galling Associated with Oxhorn Bucida Trees

A.D. Ali[1*], Doug Caldwell[2]

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Abstract

The oxhorn bucida tree (a.k.a. Black Olive), Bucida buceras (Combretaceae), occurs widely in Southern Florida and the Caribbean urban forests. It is commonly attacked by two arthropods, an eriophyid mite, Eriophys buceras (Acari: Eriophyidae), and a caterpillar, Garella (Characoma) nilotica (Lepidoptera: Nolidae). By-products of these pests such as caterpillar frass and mite-induced galls cause severe staining of sidewalks, streets and vehicles underneath the tree canopy. The staining is so aesthetically annoying that dissatisfied homeowners remove the trees. Studies were conducted over a 4-year period in 2 locations to evaluate systemic insecticide treatments against these pests. In Naples, FL, during both 2013 and 2014, trees receiving dinotefuran soil-root drench or acephate trunk injections showed slightly reduced staining possibly due to caterpillar suppression. During 2015 and 2016 in Miami, FL, abamectin trunk injections resulted in excellent reduction in gall formation and staining. Abamectin trunk injections were most reliable in reducing property owner complaints and preserving the benefits of mature oxhorn bucida trees in the urban forest. This is particularly significant in cities where the bucida tree may constitute a significant portion of the urban forest. Additionally, trunk injection represents an environmentally rational approach with none of the drawbacks associated with foliar applications which may result in drift to non-target sites, or soil drenching which may lead to runoff or groundwater contamination.

Biography

Dr. Ali has over 30 years of experience in the Green Industry. He supervises all training and technical support programs for Davey offices throughout the US and Canada. He is an Entomologist by training, a Board-Certified Master Arborist, TRAQ qualified, and served on the Board of Directors and as President of the Florida Chapter, International Society of Arboriculture. Dr. Ali has written a book on Pest Management in the Landscape. In addition, he has presented 130 scientific and training seminars, attended 135 conferences, workshops and symposia and authored more than 300 scientific and popular-oriented articles.

Chitin-triggered immunity in wheat and barley and its role during Fusarium head blight

Guixia Hao[*], Helene Tiley, Thomas Usgaard and Susan McCormick

Mycotoxin Prevention and Applied Microbiology Research Unit, NCAUR, USDA-ARS, Peoria, IL, USA.

Abstract

Fusarium graminearum is the primary causal agent of Fusarium head blight (FHB) on wheat and barley. FHB reduces grain yield and contaminates grain with various mycotoxins, predominately DON. DON acts as a virulence factor to promote the fungus pass the wheat rachis node that is a critical barrier for FHB resistance. The production of reactive oxygen species (ROS) is one of the earliest defense responses during plant and pathogen interactions. Chitin, a main component of fungal cell wall, can trigger ROS burst and plant immunity. A few studies demonstrated that hydrogen peroxide, a key player of ROS, induces DON production in F. graminearum, however, the complex roles of ROS during Fusarium and plant interactions remain unclear. In this study, we investigated ROS triggered by chitin in FHB resistant and susceptible wheat and barley. We discovered that no ROS burst was detected in chitin-treated wheat leaves, in contrast, ROS was triggered by chitin in barley leaves. We further examined ROS production in different wheat and barley tissues. Higher ROS burst was induced by chitin in wheat rachis node compared to other floral structures including lemma and palea. Higher ROS responses were observed in FHB resistant wheat varieties compared to susceptible varieties after chitin treatments. We are investigating defense marker genes expression in chitin treated wheat rachis nodes and determining their relationship with FHB severity and DON content. This study will provide novel information on ROS signaling during FHB pathogenesis and develop FHB and mycotoxin control strategies by enhancing plant immunity.

Biography

Guixia Hao is a Research molecular biologist with USDA/ARS in Peoria. After receiving her B.S. from Shandong Normal University and Ph. D from Beijing Forest University in China, she conducted postdoctoral research at Cornell University and USDA/ARS at Ft Pierce, FL. At Cornell University, she worked on characterization of the genes in Agrobacterium vitis associated with grape necrosis and tobacco hypersensitive response. With USDA/ARS at Ft. Pierce, she conducted research on characterization of virulence factors of the Huanglongbing (HLB) pathogen 'Candidaus Liberibacter asiaticus' (Las) and production of transgenic citrus resistant to HLB and canker disease. Her researches are primarily focused on characterization of the genes that affect Fusarium head blight pathogenesis and mycotoxin production to enhance food safety and crop production. Various approaches such as genetics, functional genomics, mutagenesis, RNAi, transient and transgenic gene expression are applied to study gene functions and develop novel methods for reducing disease and mycotoxin contamination.

Poster Presentations

CsPT4, cannabinoid-producing aromatic prenyltransferase from Cannabis sativa exhibited promiscuous substrate preference

Ryosuke Tanaya* and Futoshi Taura

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Abstract

Cannabinoids found only in Cannabis sativa are unique secondary metabolites consisting of olivetolic acid (OLA) and monoterpene moieties. In the last two-decade, medicinal uses of C. sativa have been approved in many countries, and cannabinoids have regained considerable attention as promising medicinal resources. In addition, Prof. Keasling's group recently reported the first complete reconstitution of the biosynthetic pathway in yeast Saccharomyces cerevisiae, leading to production of major cannabinoids from simple sugar.

In the present study, we characterized biochemical properties of CsPT4, an aromatic prenyltransferase that catalyzes condensation of OLA and GPP to synthesize cannabigerolic acid (CBGA), the central precursor for pharmacologically-active cannabinoid metabolites. The biochemical studies using microsomal fraction containing the recombinant CsPT4 in yeast Pichia pastoris confirmed that this enzyme effectively catalyzed regio-specific prenylation to afford CBGA. We studied the substrate supecificity of CsPT4. As a result, it was quite interesting observation that CsPT4 was relatively promiscuous to prenyl donor substrates. It could accept not only GPP, but also FPP and GGPP to yield CBGA analogues having different prenyl side chains. These product analogues are new-to-nature compounds that have neither been isolated nor synthesized. Thus, we named them susqui-CBGA and diterpeno-CBGA based on their prenyl chain structures. CsPT4 was highly specific to OLA, but it also catalyzed reactions from OLA analogues with various side chain structures. We are now attempting to establish an effective biochemical production system of these cannabinoid analogues using P. pastoris. The potential catalytic activity of CsPT4 could be exploited for the production of non-natural cannabinoids.

Biography

Ryosuke Tanaya (Ph.D. student) Graduated from School of Medicine Pharmaceutical Sciences for Education, University of Toyama Medicinal Bioresources Laboratory

Molecular mechanism of opaque2-mediated protein quality improvement in maize

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Abstract

Maize is an important crop in many parts of the world. Although associated with many nutraceutical properties, the protein quality in normal maize is poor. Breeders have utilized opaque2 mutation for enhancement of protein quality in the form of new varieties, referred to as Quality Protein Maize (QPM). QPM differs from normal maize in the amount of two amino acids, lysine and tryptophan, both of which are essential for human body. In QPM, lysine and tryptophan can be present in double the amount as compared to normal maize. The information about the health benefits of QPM in human and animal nutrition is already established. An understanding of the molecular mechanism is necessary for further improvement as well as manipulation of germplasm for precise gene editing. Here, we discuss the underlying molecular mechanism, with a note on the avenues available to tweak molecular interactions for improving the protein quality.

Re-foresting Urban Communities: Experiential Urban Forestry

Marguerite Beckford, EdD

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Abstract

Background: Communities derive many ecosystem services from urban forests, including reduced urban heat island temperatures, improved air quality, and positive physical and mental health impacts. In 2013, a tree canopy study of Sarasota County, Florida, indicated 35% coverage in the Urban Service Area, but there has been continual land development and consequent tree removal since completion of the study.

Purpose: To mitigate canopy loss, I launched the Treejuvenation Florida urban forestry Extension program in 2017. Objectives of the program include promoting awareness of the benefits of urban trees, encouraging community engagement in urban forestry activities, and increasing the number of trees planted throughout the county. An urban forestry Extension program designed to increase the number of tree-plantings is important, because of the continual loss of urban canopy from development.

Methods: In addition to developing and distributing urban forestry Extension publications, the Treejuvenation Florida Extension program convenes a series of quarterly urban forestry community events: TreeQuest - Florida Arbor Day scavenger hunts for native trees in local parks; Talking Trees - youth library workshops on the ecosystem services of urban forests; Tree Trail Tour - guided tree-centric nature walks in local gardens and arboreta; and Adopt-a-Tree - National Arbor Day tree planting demonstration events at various locations throughout the community. For the Adopt-a-Tree events on National Arbor Day, participants attend a class on tree care and a tree planting demonstration. Attendees pledge to plant a tree on their property, receiving up to 3 native trees per local address. To assess new tree survival rates, a follow up survey is done with participants 3 to 12 months after the Adopt-a-Tree event, with participants having the option of submitting pictures of their sapling(s) in the survey response.

Conclusion: Follow-up surveys with Adopt-a-Tree event participants show that since its launch in 2017, the Treejuvenation Florida urban re-forestation program has had 355 tree-plantings in Sarasota County, with an 84% survival rate (300 trees).

Biography

Dr. Beckford is the University of Florida IFAS Sarasota County Commercial Horticulture Extension Agent. Current focus areas are Urban Forestry, and Environmental Horticulture. Since launching Florida's first trademarked urban forestry Extension program in 2017 – Treejuvenation Florida, Dr. Beckford has sourced re-forestation funding for planting 300 community trees, has hosted 31 urban forestry Extension community events with over 400 participants, and served on the inaugural tree campus committee which was successful in earning New College of Florida, the designation as Florida's 21st Tree Campus USA location.

Dr. Beckford's work in Environmental Horticulture resulted in a successful grant application for US$25,000, to establish Miami-Dade County's first Urban Mobile Irrigation Lab. This project resulted in a 75% increase in Homeowners Associations' (HOA) water conservation. Dr. Beckford has also worked on agronomic research projects in the British Virgin Islands.

Nymphaea tetragona Georgi in Latvia

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Abstract

Nymphaea tetragona Georgi is not included in the flora of the Baltic States, in Latvian normative documents on specially protected species, and in the Latvian Red Data Book so far, because its existence has not been officially confirmed. In 2017, N. tetragona was found in the north-western part of Latvia, in a shallow depression in a dune slack formed transition mire with spring bog elements and water level 18 cm. This fresh water habitat was characterized by low macronutrient content and neutral pH. Careful research of the collected herbaria proved the existence of this species in Latvia. Consequently, depending on the characteristics of the specific habitat, in 2019, eight deposits with similar characteristics were inspected, N. tetragona was found in five. In order to preserve the diversity of nature, plant species are monitored by listing and mapping. Morphological features alone are not sufficient to distinguish and record water lily species, as their morphological parameters overlap and there are also hybrids. Examining the cross-section of the leaf's stems, we have found that, the main air channels in the center for N. tetragona are 2, while for N. alba and N. candida - 4. This feature so far was reported in Finnish NatureGate, not in scientific articles. The use of this anatomical feature could be considered as a safe express method for the detection of N. tetragona. To obtain accurate data, genetic analysis requires after then, but for habitat experts, this method can potentially help identify this species immediately in situ.

Biography

Gunta Jakobsone graduated from the Faculty of Biology of the University of Latvia. Specialty - plant physiology. Working at the National Botanic Garden of Latvia since 1973 until now. In 1983, obtained the degree of Candidate of Sciences in Biology, since 1993 - Doctor of Biological Sciences. Leading researcher and head of the Department of Plant Ecophysiology in the National Botanic Garden. Scientific topics - in vitro plant cultures as well as rare and endangered plants of Latvia in vitro and in situ.

Lateral root initiation in Sagittaria sagittifolia L. and Butomus umbellatus L.

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Abstract

In the paper, the data on micromorphology of parental adventitious and lateral roots in aerial-aquatic plants Sagittaria sagittifolia L. and Butomus umbellatus L. growing in natural conditions on the river Psel in Poltava region of Ukraine are presented. Anatomy of the adventitious roots in investigated species was typical for monocotyledonous plants. Lateral root primordia (LRPs) arose in the apical meristem of parental adventitious roots from cells of the outer layer of the pleroma (future pericycle) with a certain frequency. An increase in transcription of cyclin D3-1 and D3-2 genes in cell groups of this layer compared to adjacent meristem cells was the first indicator of the LRP initiation. The primordium formation began with periclinal divisions of increased 3-4 cells opposite to the xylem poles at the distance of 0.4 mm from the parental root apex in B. umbellatus and 0.5 mm in S. sagittifolia. Outward walls of LRP periphery cells thickened due to the deposition of cellulose, pectin and possible callose, that limits metabolic and signaling contacts between them and other cortex cells. It was firstly proved that the endoderm is not directly involved in the initiation of LRPs in these species. Growth of lateral roots had a two-phase character: 1) the rapid formation of LRPs and 2) their subsequent slow growth to

the surface of a parental root. LRP formation in the apical meristem of adventitious roots of aerial-aquatic plants is assumed to be associated with the their ecological peculiarities and may significantly contribute to survival of plants.

Biography

Elizabeth L. Kordyum is Head of the Department of Cell Biology and Anatomy of the Institute of Botany of the National Academy of Sciences of Ukraine. She has Experience of 27 years as Head of the section “Space Biology, Biotechnology and Medicine” of the Council on Space Research of NAS of Ukraine. Her major Fields of Scientific Research: plant embryology and cell biology, space and gravitational biology, experimental botany, responses and adaptation of plants to abiotic stresses. She was Awarded by National Academy of Astronautids for the book “Plants in Space”, in 2011 and in 2020 – She was Awarded by International Astronautical Federation “Hall of Fame”

Identification of metabolites present in Opuntia callus and study of their biological activities

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Abstract

The Opuntia plants contains a wide variety of compounds, which exhibit important pharmacological effects. However, there is no information about the metabolites present on Opuntia in vitro cultures, or their biological effects. This work was focused on the identification of compounds present in Opuntia ficus-indica, Opuntia megacantha and Opuntia streptacantha calluses. The antioxidant, anti-inflammatory and anti-adipogenic activities were also evaluated in mammalian cells. The mass and chromatographic analysis showed that calluses of the three species synthesized 3,5-Di-O-galloylshikimic acid as major compound; other compound identified were galloyl-quinic acid, epigallocatechin gallate, epigallocatechin glucoside and a gallic acid derivative in lower concentration. The metabolites present in O. ficus-indica, O. megacantha and O. streptacantha callus were not cytotoxic to CaCo-2 cells, macrophages RAW or 3T3-L1 adipocytes. In addition, the compounds produced by Opuntia calluses reduced 34% to 47% the reactive oxygen species formation in CaCo2 cells; the NO production, related to inflammation, was inhibited 60 to 68% using O. streptacantha extracts, 50 to 59% with O. megacantha extracts, and 36% with O. ficus-indica extracts; a moderate (23% to 30%) reduction in intracellular lipid content was observed with O. megacantha and O. streptacantha. These results prove that Opuntia callus synthesized compounds with relevant biological activities.

Biography

Maria del Socorro Santos-Diaz is head of the Plant Tissue Culture laboratory, and full professor at the Faculty of Chemistry from the Autonomous University of San Luis Potosí, México. She develops three lines of research. The first one is related to micropropagation of cacti and herbaceous species with commercial interest or threatened of extinction. The second line is focused to the obtainment of secondary metabolites from in vitro cultures with antioxidant properties or pharmacological value. The third line corresponds to the analysis of heavy metal remediation using in vitro root cultures and whole aquatic plants.