Welcome

Syeneis Group
Evolution In Generation

PLANT
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<td>09:50-10:00</td>
<td>Group Photo Session</td>
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<td>10:00-10:40</td>
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<td></td>
<td><strong>Title: Pre-Symbiotic Signals Exchange Of Hormones And Volatile Organic Compounds Between The Host-Plant Helianthemum Sessiliflorum And The Desert Truffle Terfezia Boudieri</strong></td>
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<td>Yaron Sitrit, Ben-Gurion University of the Negev, Israel</td>
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<td>10:40-11:10</td>
<td><strong>Title: Effect Of Quercetin On Mycorrhizal Synthesis Between Tuber Borchia And Micropropagated Strawberry Tree Plants</strong></td>
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<td>Filomena Gomes, Escola Superior Agraria De Coimbra, Portugal</td>
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<tr>
<td>11:10-11:30</td>
<td>Coffee break</td>
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<td>11:30-12:10</td>
<td><strong>Oral Presentations</strong></td>
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<td></td>
<td><strong>Title: The Role of Mitogen-Activated Protein Kinase (MAPK) Signalling in Oxidative Stress in the Unicellular Model Organism, Chlamydomonas Reinhardtii</strong></td>
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<td>Professor Gabor Galiba, Head of Dept. Plant Molecular Biology, Agricultural Institute, Centre for Agricultural Research, Hungarian Academy of Sciences, Hungary</td>
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<td>Tímea V. Nadai, MSc (PhD student), Festetics Doctoral School, Georgikon Faculty, University of Pannonia, 8360 Keszthely, Hungary</td>
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<tr>
<td>12:50-14:00</td>
<td>Lunch</td>
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<tr>
<td>14:00-14:30</td>
<td><strong>Title: INSECT NETTING AND GREENHOUSE BENEFITS</strong></td>
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<td>Marcel Schulte, Holland Gaas B.V., Netherlands</td>
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<tr>
<td>Time</td>
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<tr>
<td>14:30-15:00</td>
<td>Title: Dissecting The Basic Principle Of Developmental Boundary Formation</td>
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<td>Title: Revelation of the role of glucosinolates in plant defense responses against pollution stress</td>
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<td>15:00-15:30</td>
<td>Title: In vitro Growth-Promoting Activity of Galactose-Binding Lectin From Mulberry (Morus Alba L.) On Suspension-cultured Cells</td>
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<td>15:30-16:00</td>
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<tr>
<td>16:00-16:20</td>
<td>coffee break</td>
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<tr>
<td>16:20-16:50</td>
<td>Title: Integrated Approach To Investigate Poplar Roots Response To Mechanical Constraints</td>
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**E-POSTER PRESENTATION**

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<th>Time</th>
<th>Title: IDENTIFICATION OF APPLE SCAB GENETIC RESISTANCE IN MALUS SIEVERSI POPULATIONS IN KAZAKHSTAN</th>
<th>Speaker/Institution</th>
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<td>17:20-17:50</td>
<td></td>
<td>Madina Omasheva, Institute of Plant Biology and Biotechnology, Almaty, Kazakhstan</td>
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**Day 1-End Note**

**DAY-02 Tuesday | February 19, 2019**

**Keynote Presentations**

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<th>Time</th>
<th>Title</th>
<th>Speaker/Institution</th>
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<tr>
<td>09:00-09:30</td>
<td>Registrations</td>
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<tr>
<td>09:30-10:10</td>
<td>Title: APHIS Plant Grow Enhancer/ Soil Amendment Petition Process</td>
<td>Gregg B. Goodman, APHIS Plant Protection and Quarantine, USA</td>
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<tr>
<td></td>
<td>Title: Modulation of Sesquiterpene Biosynthesis and Potential</td>
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<tr>
<td>10:10-10:50</td>
<td>Pharmacological Activity in Khat (Catha edulis) Leaves Upon Harvesting</td>
<td>Efraim Lewinsohn, The Newe Yaar Research Center, Volcani Center, ARO, Israel</td>
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**Oral Presentations**

**Scientific Sessions**

- Plant Science And Natural Products
- Plant Science And Plant Research
- Plant And Environment Science
- Forest Science And Technology
- Biodiversity And Plant Ecology
- Plant Genetics And Epigenetics
- Antibiotics
- And Medicinal Plant
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<tr>
<th>Time</th>
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<th>Speaker and Institution</th>
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<tr>
<td>10:50-11:30</td>
<td>Title: Does GTS1 has an important role under stress conditions in Arabidopsis?</td>
<td>Burcu Arıkan, Istanbul University, Turkey</td>
</tr>
<tr>
<td>11:30-11:50</td>
<td>coffee break</td>
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<tr>
<td>11:50-12:20</td>
<td>Title: Medicinal Plants of the Bible - Past, Present and Future</td>
<td>Amots Dafni, Spanish National Research Council (CSIC), Madrid. SPAIN</td>
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<tr>
<td>12:20-12:50</td>
<td>Title: Tanshinones production in adventitious root and cell suspension cultures of Perovskia abrotanoides Kar. and evaluation of their biological activities</td>
<td>Arehzoo Zaker, Ph.D., Ferdowsi University of Mashhad, Mashhad, Iran</td>
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<td>12:50-13:00</td>
<td>Lunch</td>
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<tr>
<td>13:00-13:30</td>
<td>Title: Analysis Of The Gentic Variability Of The Subgenus Quercus Oerst. In Central And South Italy.</td>
<td>Fortini Paola, Università del Molise, Italy</td>
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<td>13:30-14:00</td>
<td>Title: How and why xenobiotics affect the development of cenosis (plant, fungi and bacteria) Of a Polluted Area: Bagnoli-Coroglio (SIN) Case Of Study</td>
<td>Carmine Guarino, UNIVERSITY OF SANNIO, Italy</td>
</tr>
<tr>
<td>14:00-14:30</td>
<td>Title: The Importance Of Nanotechnology In Plant Science And The Real-World Applications</td>
<td>Amanee Gordon, Tuskegee University, USA</td>
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<td>14:30-15:00</td>
<td>Title: INVESTIGATION OF HEAVY METAL CONTENTS IN SOME MEDICINAL PLANTS OF DISTRICT SIALKOT, PAKISTAN</td>
<td>Shamim Akhtar, University of Gujrat, Pakistan</td>
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<td>15:00-15:30</td>
<td>Title: The use of soybean lipoxygenase-1 as an innovative tool to study putative healthy effects of natural plant products</td>
<td>Mario Soccio, University of Foggia, Italy</td>
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<td>15:30 - 17:00</td>
<td><strong>Poster Presentations</strong></td>
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<td><strong>P01</strong></td>
<td>Title: The Seed-Specific Relative Water Content As A Physiological Trait To Track The Germination Rocess In Ceiba Aesculifolia Seeds</td>
<td>Ximena Gómez-Maqueo, Instituto de Ecología, UNAM, México</td>
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<td><strong>P02</strong></td>
<td>Title: Somatic Embryogenesis And Plant Regeneration In Japanese Pines</td>
<td>Tsuyoshi E. Maruyama, Forestry and Forest Products Research Institute, Japan</td>
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Title: Suspended Cells Of Non-Metallophyte Viola Arvensis (Violaceae) Show High Tolerance To Zinc And Lead Manifested In Their Ability To Divide And Potential For Plant Regeneration After Metal Application
Klaudia Sychta, Jagiellonian University, Faculty of Biology, Institute of Botany, Department of Plant Cytology and Embryology, Poland

Title: Evaluation Of Drought Stress In Germinating Opium Poppy
Jiri Cerven, Ph.D., University of Ostrava, Czech Republic

Title: Distribution Of Mercury In Aediments And Plant Tissues Of Rhizophora Apiculata And Rhizophora Mucronata at Matang Mangrove Forest Reserve, Malaysia
Giovanna Wolswijk, Erasmus Mundus Master Course in Tropical Biodiversity and Ecosystems (TROPIMUNDO), Belgium

Title: Effect Of Flavonoids On Mycorrhizal Synthesis Between Lactarius Deliciousus And Arbutus Unedo L. In Vitro Plants
Filomena Gomes, Escola Superior Agrária de Coimbra, Portugal

Title: The Role Of Photosynthetic Pigments In Seeds Differing In Resistance To Desiccation
Ewelina Stolarska, M.Sc., Institute of Dendrology, Polish Academy of Sciences, Kórnik, Poland

Title: The CRK5 Kinase Negatively Controls Senescence-Related Genes During Plant Development
Pawel Burdiak, Warsaw University of Life Sciences, Poland

Day 2-End Note

DAY-03 Wednesday | February 20, 2019

09:00-09:30 Registrations

Oral Presentations

Scientific Sessions

Antibiotics and Medicinal Plants, Genetics and Plant Breeding, Plant Science and Plant Research, Others

Session Chair: Gregg B. Goodman, APHIS Plant Protection and Quarantine, USA
Session Co-Chair: Efraim Lewinsohn, The Newe Yaar Research Center, Volcani Center, ARO, Israel

09:30-10:10 Title: Plant defense genes: structural diversity and applications
Prof. Dr. Ana Maria Benko-Iseppon, Universidade Federal de Pernambuco, Brazil
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<td>10:10-10:50</td>
<td>FT-IR spectroscopy combined with Principal Component Analysis allows studying in situ molecular processes involving cellulose, hemicellulose and pectin in plant cell walls during plant cell evolution</td>
<td>Francesca Monti, Associate professor, University of Verona, Italy</td>
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<tr>
<td>10:50-11:30</td>
<td>Biofortification of common bean through phytic acid reduction</td>
<td>Francesca Sparvoli, PhD, Institute of Agricultural Biology and Biotechnology, CNR, Milan, Italy</td>
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<tr>
<td>11:30-11:50</td>
<td>coffee break</td>
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<tr>
<td>11:50-12:30</td>
<td>The Growing Cannabis Community - history, innovations, and the future.</td>
<td>Jes Kristof, VP of Research and Development, Phylos Bioscience, USA</td>
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<td>12:30-13:30</td>
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<td>13:30-14:00</td>
<td>Independent Evolution of Korean Weedy Rice</td>
<td>Patrick Vigueira, High Point University, USA</td>
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<td>14:00-14:30</td>
<td>The phloem as a vascular integrator of whole-plant growth and development.</td>
<td>SHMUEL WOLF, The Hebrew University, Israel</td>
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**END NOTE AND CLOSING CEREMONY**

**About PLANT 2020**

2nd EDITION OF INTERNATIONAL CONFERENCE ON PLANT, CELLULAR AND MOLECULAR BIOLOGY

February 25-27, 2020 | Rome, Italy

https://www.plantconferences.com/index.php
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About Syeins Group

Syeins Group (SG) is a professional organization meant for research development and promotion in the field of Science, Engineering, Technology, Management, Social Science, Medical & Health Science. We are experts in organizing conferences, meetings, and workshops throughout the world to improvise the issues of good communication between scientists, researchers working in relevant fields or in interdisciplinary research.

Syeins Group (SG) Emphasise on the globalization of innovation of scientists, professionals, students, research scholars and academicians working in various fields of Science, Engineering, Technology, Management, Economics, Social Science, Medical & Health Science. The events, workshops, and conferences conducted by Syeins Group are the platform where researchers can present their innovative and professionals for academic as well as industries can submit their cutting-edge research.

Vision
Sharing the Global of Science

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INTERNATIONAL CONFERENCE ON
PLANT, CELLULAR AND
MOLECULAR BIOLOGY
February 18 - 20, 2019 | Valencia, Spain
The desert truffle Terfezia boudieri establishes mycorrhizae with Helianthemum sessiliflorum (Cistaceae) during the short wet season in desert habitats. Establishment of successful association needs to overcome two major challenges (1) low number of penetration sites available along the main root. (2) The differential growth rates of the fungus and its host. Since the host root growth rate is ten-fold higher than the mycelia the fast growing root may readily cross the mycelia inhabiting the upper soil layers while evading inoculation. We report here on mechanisms that the fungus has acquired to assure efficient inoculation. One of these mechanisms includes the secretion of the plant hormone indole-3-acetic acid (IAA) by the fungus. Secreted fungal IAA induces proliferation of lateral roots and inhibits tap root growth resulting in higher number of penetration sites and coordinated growth rates between partners. We also show, in Arabidopsis mutants, that roots respond to the secreted IAA prior to the physical contact, as evidenced by analyses using the DR5-GUS, IAA sensitive promoter. The second novel mechanism is IAA interference with the gravitropic response of the tapb root. In dual cultures roots deviate from the gravity axes in response to the secreted IAA. The third mechanism is emission of volatile organic compounds (VOCs) mainly 1-octene-3-ol that modify the tap root architecture. This volatile induces tap root growth inhibition and the lateral roots formation.

We propose that fungal VOCs and IAA redirect tap root growth retaining the fungal penetration sites in roots in the upper soil layers colonized by the fungus and induce lateral roots proliferation by long distance fungal signals secretion at the presymbiotic stage.

**Biography**

Prof. Yaron Sitrit is a member in The Jacob Blaustein Institute for Desert Research, Ben-Gurion University of the Negev. The focus of the research I have developed during the last years has been on understanding the mechanisms involved in plants adaptation to desert conditions. The research topics include (A) Identification of key genes involved in natural product formation, mainly aroma volatiles. (B) Developing desert truffles as a new crop for arid zones, while studying the mycorrhizal interaction between the truffle and its host plant. Prof. Sitrit joined the Be-Gurion University in 1999 after a postdoctoral stay in UC Davis CA, and the Weizmann Institute for Science working on plant and fruit physiology. He obtained his Ph. D. degree from the Hebrew University of Jerusalem in Israel, studying molecular mechanisms involved in biological control of plant pathogenic fungi.
Effect of quercetin on mycorrhizal synthesis between Tuber borchii and micropropagated Strawberry tree plants

Strawberry tree (Arbutus unedo L.) is a Mediterranean species, which became important for forestation due to its drought tolerance, land recovery, regeneration capacity following fires and fruit production. Adult plants selected for fruit production and quality were micropropagated and clonal trials established for clonal evaluation. New orchards have been established considering the higher production of clones compared to seedlings.

The inoculation with the mycorrizal fungi Tuber borchii allows the establishment of more prolific orchards supporting advantages conferred by the production of edible mushrooms. Quercetin, among flavonoids, is known by stimulate the mycorrhization, promoting the spore germination and hyphal branching.

The objective of this study was to evaluate the effect of quercetin addition during the mycorrhization process using spores of Tuber borchii. Two genotypes (micropropagated clones of Strawberry tree) and five quercetin levels (0.5 – 10 µM, compared to control) were tested after the addition to different media for inoculation (one medium culture compared to water distilled and sterilized). Perlite was used as substrate for inoculation which was performed during ex vitro rooting simultaneously with acclimatization. Inoculation and acclimatization was performed in the culture chamber, using closed transparent containers to keep high humidity level. During plant hardening, the levels of humidity were gradually decreased. Six months after inoculation (in the culture chamber), plants were transferred to field containers and roots were analyzed. The mycorrhization level was dependent of genotype, quercetin level and media culture (P<5%). When quercetin was added, a higher level of mycorrhizae establishment was observed compared to control. However, clones showed different response to quercetin addition. The most productive clone was selected, roots examined before field trial establishment, which intends to confirm long term persistence of mycorrhizae and to evaluate the fungal colonization level required to guarantee mushroom production.

Biography

Lecturer at the Coimbra / ESAC, Graduate in Forestry with master’s and PhD in Plant Biology.

Professional career began as a teacher of Soils and Fertility (1982-85).

From 1985 to 1995 worked in the area of tree breeding and plant propagation at Portucel Florestal.

Since 1995, at ESAC as a teacher in the Forestry Department. Since 2005 has been working on plant breeding of Arbutus and Chestnut. Since 2012 has been collaborating in research and development projects (ProDeR, FCT, PDR2020), with several partners, to improve vegetal material and cultural practices, collaborating with Research & Development Entities, Associations and Forest Producers.
INTERNATIONAL CONFERENCE ON

PLANT, CELLULAR AND MOLECULAR BIOLOGY

February 18 - 20, 2019 | Valencia, Spain

ORAL SPEAKERS
The Role of Mitogen-Activated Protein Kinase (MAPK) Signalling in Oxidative Stress in the Unicellular Model Organism, Chlamydomonas reinhardtii

Tímea V. Nádai, MSc (PhD student)  
Festetics Doctoral School, Georgikon Faculty, University of Pannonia, 8360 Keszthely, Hungary / Department of Plant Molecular Biology, Institute of Agriculture, Centre for Agricultural Research, Hungarian Academy of Sciences, Brunszvik u. 2., Martonvásár, H-2462, Hungary

Nowadays algal biotechnology has become a rapidly developing field. Algae are currently exploited for the production of secondary metabolites as high value products for commercial usage: human and animal consumption, colouring agents, cosmetics, pharmaceutical row materials. Furthermore, they are also envisaged as producers of next generation biofuels and ideal candidates for bioremediating waste water and CO2.

In unicellular algae growth and cell cycle progression are tightly connected to the environmental conditions. Furthermore, adaptation to stress means significant changes in metabolism. In order to sense and regulate responses to environmental stimuli complex cellular signalling networks have evolved, like the mitogen-activated protein kinase (MAPK) phosphorylation cascades which are central regulatory mechanisms in all eukaryotes. Their functions in cell cycle regulation and in stress responses in yeast and human cells are described to great detail. They play key roles in regulating stress responses in plants, yet our knowledge on MAPK signalling in plants is limited in comparison to yeast and mammalian systems. A unicellular plant model offers an efficient experimental system and an evolutionary framework to study MAPK signalling in the plant kingdom. Very little is known about environmental adaptation and signalling in microalgae. Their high economic potential further underscores the importance of studying gene regulatory mechanisms in them.

For the initiation of algal MAPK signalling studies we have utilised Chlamydomonas reinhardtii, an excellent laboratory model species, which is a well-established system to study cellular biological processes, like photosynthesis, cell cycle, gene regulation. For the functional analysis we cloned selected Chlamydomonas MAPK signalling genes and generated transgenic constructs. These Chlamydomonas lines along with the wide type and the insertion mutants are characterised in terms of stress responses. Furthermore, we carried out a transcriptome analysis for the better understanding of key MAPK functions in algae. Our results reveal a unique involvement of MAPK in modulating ROS response and the expression of ROS metabolic enzymes in Chlamydomonas.

This work is supported by the National Research, Development and Innovation Office (NKFIH) (OTKA NN 114511).

Biography

Tímea V. Nádai received a bachelor's and a master's degree in biochemical engineering, with the specification of applied biotechnology, from Budapest University of Technology and Economics. Now she is a second-year PhD student at the University of Pannonia, Georgikon Faculty, Festetics Doctoral School. The Department of Plant Molecular Biology, Institute of Agriculture, Centre for Agricultural Research, Hungarian Academy of Sciences gives place for her experimental laboratory work. Her research topic is the regulation of stress adaptation in cultured microalgae.
Efficient tissue culture and plant regeneration for transformation and gene editing in cereals

Yuji Ishida (Ph.D.), Hiroshi Tsukamoto (Ph.D.), Masako Ichikawa (Ms), Yukoh Hiei (Ph.D.), Toshihiko Komari (Ph.D.)
Japan Tobacco Inc, Japan

Biotechnology must be an essential component of the efforts to sustain and elevate grain production to support growing human population in the world. Genetically modified crops, such as maize varieties resistant to pests and herbicides, have been grown since the middle of the 1990s and occupied 185.1 million hectares of farm land in 26 countries in 2016. These crops significantly contribute food to the current population and must further be improved. In addition to the modification by stably integrated transgenes, editing of native genes by CRISPR/Cas9 and other site specific endo-nucleases is giving a new dimension to crop breeding, and regulatory hurdles may be much lower for the edited plants. In both stable transformation and gene editing, foreign nucleic acids and proteins are first transferred to plant cells, and then transgenic or edited plants are regenerated from the modified cells. Therefore, tissue culture technologies to support efficient proliferation of and regeneration from the treated cells are equally and fundamentally important in these approaches.

We have been developing and improving protocols for genetic transformation of major cereals, key staples for human beings such as rice, maize, wheat, barley, and sorghum, mediated by Agrobacterium tumefaciens for nearly 30 years. We have found that numerous factors, including types and stages of tissues infected, concentration of inocula, tissue culture media, type of transformation vectors, strains of A. tumefaciens, selection markers and selective agents, and genotype of plants, are of critical importance. We keep insisting that immature embryos are the most efficient starting tissues in the major cereals and must be prepared from healthy mother plants grown in well-conditioned glasshouses. After years of the efforts, the major cereals may now be transformed very efficiently by highly optimized protocols. For example, more than 15 independent transgenic plants could be obtained from a single piece of immature embryo in rice. Even in less efficient crops, transformants could be obtained from more than 20% of the embryos. Most of the tissue culture techniques developed in the endeavour must also be useful in gene editing, and thus development of protocols for efficient production of edited plants is another important task for us.

Biography

Education and academic degrees:
September 2004 PhD, Agricultural Sciences, Gifu University
March 1984 BSc, Department of Agriculture, Shizuoka University

Employment and professional career:
April 1984 Joined Japan Tobacco Inc as a Research Scientist
April 2017 - present Senior Research Scientist, Japan Tobacco Inc.
INSECT NETTING AND GREENHOUSE BENEFITS

Marcel Schulte
Holland Gaas B.V., Netherlands

Why invest in greenhouses?

The world population is expected to reach 9.8 billion in 2050. Available land for horticulture will continue to decrease and therefore more expensive. And organic methods are of increasing interest to many growers. The solution is a durable high-tech greenhouse that gives more production per square meter.

Why insect netting?

Food safety and environmentally cultivation became a standard. Holland Gaas supplies insect netting systems that are durable and reduces the use of pesticides around the globe. An insect netting system prevents insects from using the air vents. This way you can keep harmful insects (like pepper weevil, whitefly, aphid, leafminer and thrips) outside, or keep useful insects inside the greenhouse in an environmental friendly way while having maximum ventilation and a minimum loss of light.

Why the folding (accordion) system?

There are different types of netting. Whatever you choose, it’s important to choose a high quality netting system that is strong enough to survive heavy climate conditions. The compact folding (accordion) system is suitable for existing and new greenhouses. This system ensures maximum ventilation and a minimum loss of light. This carefully designed and durable system with its permanent folds ensures perfect folding and a tight closure of the greenhouse roof. It provides a uniform air flow and protects the crop against rain.

The material of the netting construction is of high quality and very durable. The net is made of UV resistant (1150 kLangleyl) and water resistant material. The netting material is also dirt repellant and easy to clean.

Summary of benefits:

- The netting keeps out harmful insects
- The netting keeps beneficial insects in
- The netting ensures that little to no pesticides are needed
- The netting creates diffused light
- The netting ensures good ventilation, even during rain
- The netting has a high UV resistance
- The netting ensures a strong crop
- The netting results in cost savings due to the benefits

Biography

Marcel Schulte is the co-owner of Holland Gaas, an organization specialized in insect netting systems for the horticulture sector. Marcel studied International Management in The Hague and proceeded to work in the horticulture. Passionate about netting solutions Holland Gaas was born in 2005. Marcel has mastered the ins and outs of netting solutions and invented together with his team some new netting systems for greenhouses. Benefits like keeping insects outside (or inside), more light and more ventilation in the greenhouse are leading. The custom-sized netting systems are currently supplied and installed all over the world.
Dissecting the basic principle of developmental boundary formation

Noemi Svolacchia, Raffaele Dello Ioio, Elena Salvi, Emanuela Pierdonati, Emanuela Pedrazzini, Alessandro Vitale, Rosangela Sozzani, Philip N. Benfey, Wolfgang Busch, Paolo Costantino, Sabrina Sabatini, Riccardo Di Mambro*.

Presenters: Riccardo Di Mambro
Department of Biology, University of Pisa - via L. Ghini, 13 - 56126 Pisa, Italy

The maintenance of boundaries between neighboring groups of distinct cells types is vital during development of multicellular organisms, as groups of cells with distinct functions must be kept physically separated to guarantee correct control of organ and body function. In the Arabidopsis root, the transition zone is a developmental boundary in the meristem that separates dividing from differentiating cells. The root meristem is a localized structure that sustains post-embryonic root development. Within the meristem a stem cells niche continuously originates daughter cells that eventually differentiate, at the transition zone, into the mature root tissues. We combine computational modelling with molecular genetics to understand the basic principle of boundary formation and maintenance. With this approach we unveiled the crucial role of molecules with morphogenetic property in determining the position of the transition zone and in controlling cell differentiation.

Biography

2016-present: Assistant Professor of Plant Physiology at the University of Pisa, Italy.

2017-present: Affiliate Researcher at the Sant’Anna School of Advanced Studies, Italy.


Ph.D. degree in Genetics and Molecular Biology at the University of Rome “La Sapienza”, Italy. European Molecular Biology Organization fellowship (ASTF 260-2011), receiving institute: Laboratory of Prof. Philip Benfey, Duke University (NC, USA). Fellowship for excellence in academic performance of PhD School in Genetics and Molecular Biology - XXV cycle - “La Sapienza” University of Rome, Italy. Member of the College School Board of PhD school in “Biology” - XXXIV cycle, University of Pisa.
Revelation of the role of glucosinolates in plant defense responses against pollution stress

Mariam Betsiashvili*1, Ph.D., Stefanie Bank2 Ph.D., and Ulrike Holzgrabe2 Prof.
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Plants protect themselves by producing a large and diverse array of organic compounds called as secondary metabolites. Glucosinolates - biologically active secondary metabolites, serve not only as defense mechanisms against biotic and abiotic stresses, but also promote plants tolerance to toxins. Thus, the aim of the research was to investigate glucosinolates composition of different cruciferous vegetables and reveal their role in plant resistance mechanism against pollution stress. Different anthropogenic types of toxic compounds: oil hydrocarbons (benzene, anthracene), industrial chemical - bisphenol A, and common pesticide – bentazone were chosen for the experiments and cruciferous vegetables: Garden cress (Lepidium sativum), watercress (Nasturtium officinale) and radish (Raphanus sativus L) were selected for the investigation.

Plants seeds were grown on the medium of selected chemicals at increasing concentrations. Toxicants actions were assayed according to the changes in 7th and 10th days plant leaves glucosinolates content. As a result of LC/MS studies the main components of the L. sativum leaf tissue extract acquired in negative ion mode and eluted at 9.6 min was identified to be benzyl glucosinolate (glucotropaeolin, with m/z 409.1). Two glucosinolates were identified in watercress leaf tissue: the main – aromatic glucosinolategluconasturtiin (2-phenethyl glucosinolate) eluting at 13.8 min, m/z 422.9 and minor – 4-methoxyglucobrassicin (4-methoxy-3-indolylmethyl glucosinolate) eluting at 12.3 min, m/z 478.9. The glucosinolate profile in R. sativus leaf tissue revealed the main – glucoraphenin (4-Methylsufinyl-3-butenyl glucosinolate) eluting at 2.5 min, m/z 434.5 and minor compounds – glucoputrajivin (1-Methylethyl glucosinolate) eluting at 2.1 min, m/z 359.3 and in small amounts 4-methoxyglucobrassicin and glucoraphasatin in the extracts of radish leaves.

Treatment of different cruciferous plants with toxic compounds caused an increase in concentration of the main glucosinolates (glucotropaeolin, gluconasturtiin and glucoraphenin) almost proportionally to the concentration of the toxicants applied. Induction in glucosinolate accumulation as well as amount of penetrated toxicants was stronger in 7 days old plants seedlings leaves. The correlation between amount of remaining toxic compounds and accumulated glucosinolates suggested glucosinolates as markers, responsible for coping with specific toxic compounds and proved their important role in determining of plant resistance. Plants species with higher resistance abilities to specific types of toxic compounds were revealed and their application in phytoremediation techniques with targeted contaminant are suggested.

Biography

2017-2018 Fulbright Scholar, University of California San Diego, CA, USA
From 2015 Manager of the Bank of Plant Genetic Resources, Agricultural University of Georgia
From 2013 Associate Professor, Agricultural University of Georgia
2013, 2013-2014 Post-Doc., Boyce Thompson Institute for Plant Research, Cornell University, USA
2010–2013 Project Manager, Georgian National Science Foundation, Project #1-8/35
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1990 – 1995 M.S., Biotechnology, Georgian Technical University
In vitro Growth-Promoting Activity of Galactose-Binding Lectin From Mulberry (Morus Alba L.) On Suspension-cultured Cells

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Intracellular communications among plant cells are regulated by many metabolite-based hormones. However, in recent years small proteins and peptides have been discovered as important cell-to-cell communication signals underlying many plant biological processes. Experimental evidence is rapidly accumulating to show the distribution of biologically active proteins known as lectins that involved in cell division and developmental control. In the present study we proposed the possible growth-promoting activity of galactose-binding lectin from Morus alba L. seeds (MAL) on in vitro cultures. Mulberry lectin (MAL) was purified by affinity chromatography on agarose-GalNAc. In vitro cultures were established using seeds and axillary buds of mature trees as an explant. Callus and cell suspension cultures were originated from mulberry hypocotile segments obtained from in vitro seedlings. Growth stimulation by MAL was tested on hypocotyl clippings and internodal segments of in vitro grown plants. Cell proliferation was monitored by counting the number of cells. Affinity purified MAL initiated the rapid increase of apical sections of mulberry hypocotyl clippings showing 58% growth increment. MAL had significant effect on internodal segments of in vitro grown mulberry plants. Lectin showed cell proliferation activity when added on cell suspension culture at 0.26µg/ml. In combination with 2,4-D and kinetin proliferation index was increased twenty times at exponential stage. Inhibition of proliferation of hypocotile-derived suspension cells by D-galactose implying that carbohydrate-binding site of MAL may aid in binding activity. Data suggest that further work is necessary to characterize the growth stimulating role of galactose-binding MAL lectin, as these findings may be promising for the potential non-toxic growth stimulating agents for agricultural application.

Biography

Full name: Eka khurtsidze

Academic Degree: PhD in Biological Sciences, Biochemistry.

Position: Invited lecturer, Faculty of Exact and Natural sciences/Department of Plant Physiology, Iv. Javakhishvili Tbilisi State University; Associate Professor, Department of Medicine and Rehabilitation / Department of Biochemistry, Georgian State University of Physical Culture and Sports.

Over the last 5 years: Presentations at 12 international Scientific Conferences, Publications 13 scientific articles, Participation in 6 Research Projects.

Interest in science research: Plant tissue culture, Biochemistry, Biotechnology, Micropropagation.
How and why xenobiotics affect the development of cenosis (plant, fungi and bacteria) of a polluted area: Bagnoli-Coroglio (SIN) case of study

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A study was undertaken to identify the development of different native cenosis in a of systems for the phytomanagement of Bagnoli brownfield site (Italy). A phytoecological survey allowed us to recognize 139 plant taxa belonging to 58 different families. The most represented families were in the decreasing order Poaceae > Fabaceae > Plantaginaceae > Apiaceae. The biological spectrum showed a predominance of Therophytes > Hemycriptophytes > Phanerophyte. 76 areas were selected on the presence of colonist’s plants and vegetation assemblage patterns. At each site, roots and leaves of the dominant plant and rhizosphere soils were sampled. Total content of metal(loids), PAHs, HC and PCB in soils and plant were determined and agronomic soil parameters were studied. Besides bacteria diversity in the rhizosphere was evaluated by metagenomic approach; bacteria were also isolated to detect their PGPR activities.

The results indicated that the brownfield site’s contamination is relevant and mainly dominated by organic compounds; its origin is mostly due to the industrial activities that had been working for decades. The native plant species acted as perfect candidates for phytostabilization of both inorganic and organic contaminants, showing limited metal translocation to shoots. Regarding to metal(loids), we found that high calcium soil content might reduce their uptake in plants, since calcium and metals compete for uptake in plants when they co-occur in soil. Plant species with fibrous root system generally showed a higher microbial activity, able to improve phytostabilization and degradation of organic contaminants.

According to our preliminary results, several combinations between plants and microorganisms are being further investigated to identify relevant biological system for the phytomanagement of this contaminated area.
Identification of apple scab genetic resistance in malus sieversii populations in kazakhstan

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Apple is a host to a wide range of pests and diseases, a number of which need to be controlled for profitable commercial production. Scab disease, caused by the fungus Venturia inaequalis is one of the most damaging diseases in economic terms, as most climates where apples are grown are conducive to apple scab. In 2011 Bus et al. supported the idea that the disease emerged in the center of origin of apple, Central Asia, with M. sieversii as the likely original host of V. inaequalis. In this study, 311 samples randomly collected in 12 populations of M. sieversii belonging to three geographical areas, 16 wild apple genotypes previously selected by A. D. Dzhangaliev in 1990, and 50 apple cultivars being grown in Kazakhstan were studied using 11 SSR markers and 2 SCAR markers associated with scab resistance genes. These markers are covering 11 Rvi genes identified in various cultivars and a few wild relatives. Mostly all resistance alleles were evenly distributed. Three populations (Almaty reserve, Belbulak, Great Almaty gorge) originating from Zailiysky Alatau region and one population from eastern Kazakhstan (Chernoff River) showed the highest percentage of alleles identical in size with those which are described to be linked to the resistance trait. Whether these genotypes really bear one of the Rvi genes cannot be stated without doubt. Further research to answer this question is required. Nevertheless, the presence of those marker alleles are at least a first indication.
INTERNATIONAL CONFERENCE ON

PLANT, CELLULAR AND MOLECULAR BIOLOGY

February 18 - 20, 2019 | Valencia, Spain

KEYNOTE FORUM
There has been a surge of interest in identifying, importing, studying, and marketing various plant growth enhancer and soil amendment products in the United States (U.S.) within the last few years. I review and respond to these requests for the U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS) and analyze each one based on the composition of the product and intended use. Many of these products contain biocontrol/ biopesticidal microorganisms (e.g., soil bacteria). APHIS Plant Protection and Quarantine (PPQ) works closely with the U.S. Environmental Protection Agency (EPA) in assessing risks of these products with respect to the environment, agriculture, and natural resources. Some of these products must receive either EPA registration or permit and/ or an APHIS plant pest permit for commercial distribution or use. At times, products are exempted from EPA registration based on label claims. Therefore, APHIS may make the final determination of requirements for the importation and commercial distribution of these products. Some products also contact animal components and I collaborate with APHIS Veterinary Services on such requests. I will present the APHIS questionnaire-based analysis process and potential regulatory actions as well as several case studies.

**Biography**

Throughout his United States Federal career, Gregg has worked for the U.S. Dept. of Agriculture's Agricultural Research Service and Animal and Plant Health Inspection Service (APHIS), the National Institutes of Health, and the Navy. He worked for a small biotechnology company for 5 years prior to his Federal service. He joined APHIS's Biotechnology Regulatory Services in 2004 as a Biological Scientist/ Compliance Officer. He then joined APHIS's Plant Protection and Quarantine as an Export Specialist in 2006 and after worked on the Quarantine Policy Analysis and Support staff where he worked on quality management initiatives and later served as the National Postentry Quarantine Coordinator and the Senior National Seed Health System Accreditation Manager. He has been with the Pests, Pathogens, and Bio control Permits and Containment, Soil, and Federal Noxious Weeds Permits Branches since 2012. His responsibilities include making regulatory determinations for various plant pathogens and pests including weed and microbial bio control organisms, arthropods, mollusks, soil, foreign noxious weeds, and plant growth enhancers/ soil amendments. He also serves as the Executive Secretary for the interagency Technical Advisory Group for Biological Control Agents of Weeds. Gregg has a B.S. in Biological Sciences from the University of MD and a M.S. in Biotechnology from the Johns Hopkins University.
Khat (Catha edulis) leaves are traditionally chewed in East Africa and the Middle East for their psycho-stimulating amphetamine-like properties. In addition to S-cathinone and other pharmacoactive phenylpropylamino alkaloids, leaves accumulate other metabolites including volatile mono- and sesquiterpenes as well as non-volatile quinone methide triterpenes and cathedulin alkaloids exhibiting substantial pharmacological interest. Sesquiterpenes are common in plants and often accumulated as defense compounds in response to mechanical injury or biotic challenges. In this work we characterized the sesquiterpenes present in khat leaves in response to harvesting. Leaf volatiles were sampled using solid-phase microextraction (SPME) coupled to GC-MS. Harvesting the leaves resulted in marked increases in the total sesquiterpene content, and especially in the levels of α-copaene and (E)-caryophyllene, the latter is a modulator of cannabinoid action which influences the therapeutic properties of cannabis by binding to and activating the human CB2 receptor. To test for the potential sesquiterpene biosynthetic capacity of khat leaves, crude protein extracts were incubated with farnesyl diphosphate as a substrate and the sesquiterpenes produced in vitro were identified using GC-MS. Increased biosynthetic potential for sesquiterpenes, including (E)-caryophyllene, elemol, and α-eudesmol were detected in extracts from harvested leaves as compared to controls. Deep RNA sequencing of harvested and intact leaves resulted in the identification of novel putative terpene synthase genes transcriptionally upregulated upon harvesting. Functional expression of three of these genes indicated that they encode proteins catalyzing the formation of sesquiterpenes from farnesyl diphosphate in vitro. CeTps17580 produces mainly α-copaene and α-elemene, CeTps13580 generates mainly elemol and α-eudesmol, while CeTps6019 synthesizes a mixture of α-copaene, α-cubebene, γ-cadinene and δ-cadinene as main components. The identification and characterization of these genes together with analysis of their expression levels as a result of harvesting will help us to better understand the mechanism that brings about phytochemical changes in khat leaves upon harvesting.

Biography

Dr. Efraim Lewinsohn is a senior researcher in the Department of Vegetable Crops in the Newe Yaar Research Center, Agricultural Research Organization, The Volcani Institute, Israel. Dr. Lewinsohn’s main scientific interests reside in the elucidation of metabolic pathways to natural products in plants and the utilization of biotechnology to improve the quality of agricultural produce. Special emphasis is the application of functional genomic methodologies and metabolomics to understanding and manipulating metabolic pathways to enhance and modify the aromas of fruits, flowers and spice plants. In the last years, Dr. Lewinsohn's laboratory has gained expertise in alkaloid metabolism, medicinal plants and in the ecological interactions of plant specialized metabolites with insects.

Dr. Lewinsohn joined the Newe Yaar Research Center in 1995 after a postdoctoral stay in Washington State University working on terpenoid metabolism in conifers. He obtained his Ph.D. degree from the Weizmann Institute of Science in Israel, studying key enzymes in the biosynthesis of bitter flavonoids in citrus.
INTERNATIONAL CONFERENCE ON

PLANT, CELLULAR AND MOLECULAR BIOLOGY

February 18 - 20, 2019 | Valencia, Spain

ORAL SPEAKERS
Does GTS1 has an important role under stress conditions in Arabidopsis?

1. Burcu Arıkan, MSc, Istanbul University1, Ash Semerci, BSc, Istanbul University2, M. Rabia Ceylan, BSc, Istanbul University2, Özgür Çakir, Dr., Istanbul University1, Neslihan Turgut-Kara, Assoc. Prof., Istanbul University3

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Plants are subjected to various biotic and abiotic stress conditions (pathogens, salinity, drought, cold) in nature. They have evolved different ways to cope up with these stressors. In stress response and adaptation, signalling has big importance. Scaffold proteins act as key regulators in majority of the signalling pathways by binding or interacting with other components of signalling cascades. The so-called WD-repeat (WDR) proteins, that have WD-40 motif, also take place in DNA-protein and protein-protein interactions and they are important for stress tolerance and adaptation. GIGANTUS1 (GTS1) is the first protein, that belongs to transducin/WD40 protein superfamily, identified in Arabidopsis thaliana, and its knockout mutant showed improved growth phenotype. Also, GTS1 is responsible for ribosome biogenesis, seed germination and biomass accumulation in plants. In this study, The main question is “Does GTS1 has an important role under stress conditions in Arabidopsis?” Therefore, we investigated the stress response of GTS1 gene in Arabidopsis thaliana development. In the first part of our study, we applied the different stress factors to test which factor is directly effects the expression of the gene. Such as, abscisic acid (ABA), sodium chloride (NaCl) and yeast extract (YE). We used 10 days old (referred as 'young') and 30 days old (referred as 'old') sliced Arabidopsis plant tissues. According to our first results, in the expression pattern of GTS1 gene there was no significant change in the samples treated with ABA and NaCl instead of YE. In the second part of the study, we investigated the expression of GTS1 gene in wild type Col-0 and gts1 mutant (SALK_010647C) plants after application of 1 g/l or 2 g/l YE for 24 h and 48 h time periods. Then, we checked GTS1 gene response by qPCR. As a consequence, the results suggest that yeast extract stress has an important effect on GTS1 expression.

Biography

Medicinal Plants of the Bible - Past, Present and Future

Amots Dafni (Institute of Evolution and the Department of Evolutionary and Environmental Biology, Haifa University ISRAEL)
Barbara Boeck (Institute of Mediterranean and Near Eastern Languages and Cultures (ILC), Spanish National Research Council (CSIC), Madrid. SPAIN)

Based on data on archaeobotany and ethnobotany of the Holy Land, survey of the use of medicinal plants in the Holy Land throughout history as well as at the present time, and a revision of the medicinal plant of Assyria we suggest a new list of the Medicinal Plants of the Bible.

While Duke and Duke (1983) enumerated not less than 176 plant species as “Biblical Medicinal Plants” and Jacob (1993) only 54, in our survey we suggest reducing that figure to 37. The overlap between Jacob’s list and ours is 19 species in total. Our contribution is 18 “new” suggested Biblical Medicinal Plants. This discrepancy is due to three reasons: 1. Not less than 22 species in Jacob’s list are not recognized today (Amar, 2012) as valid Biblical plants names at all, or they are not related to specific species. 2. Several identifications from Campbell-Thompson (1949), the only Mesopotamian source used by Jacob, are no longer recognized by modern Assyriologists. 3. Several Mesopotamian plants were only recently identified in medical context.

Only five species are mentioned directly as medicinal plants in the Bible: Fig (Ficus carica), Nard (Nardostachys jatamansi), Hyssop (Majorana syriaca), Balm of Gilead (Commiphora gileadensis) and Mandrake (Mandragora officinarum= M. autumnalis). Not less than 18 medicinal plants, additional to the Bible, are mentioned in old Jewish post-Biblical sources. Most of these plants (15) are known also in Egypt and Mesopotamia while 3 only from Egypt. Seven of the BMP’S species are not mentioned in the Bible or in the old Jewish Post- Biblical literature but were recorded as medicinal plants from Egypt as well as from Mesopotamia, and it is quite logical to assume that they can be included as BMP’s.

According to our survey, all the 37 suggested BMP’s are still in medical use today in the Middle East and are subjected, at the 21 century, to an active research in attempts; to understand their chemical composition and/or Medical activity and/or Isolation of new compounds for new drug development.

Shakya (2016) mentioned “Top 25 Bioactive Compounds of Medicinal plants”, his list includes also : Curcuma longa, Ricinus communis, Piper nigrum, Aloe vera, Nigella sativa, Artemisia absinthium and Allium sativa = 19% of our list of Biblical Medicinal Plants!!

As written in the Bible: “That which has been is what will be, That which is done is what will be done, And there is nothing new under the sun”. (Ecclesiastes 1:9)

References:
Tanshinones production in adventitious root and cell suspension cultures of *Perovskia abrotanoides* Kar. and evaluation of their biological activities

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*Perovskia abrotanoides* Kar., a member of Lamiaceae family, is a traditional medicinal plant, growing in various regions of Iran. The roots of this plant contain a large amount of diterpenoid tanshinones. Taking into therapeutic importance attributed to *P. abrotanoides* and tanshinones, the present investigation was carried out to study tanshinones production in in vitro cultures, for the first time. Leaf explants were incubated on MS medium supplemented with different concentrations and combinations of plant growth regulators, including IAA, IBA and NAA at 0 – 4 mg/L and Kin or BA at 0.1-0.75 mg/L concentrations. Callus induction from leaf explants was achieved at all MS media containing auxins in combination with cytokinins. The MS medium supplemented with 2 mg/L NAA was the best medium to induce adventitious roots, according to percentage of rooting and roots induced per explants. Among different biotic and abiotic elicitors tested (yeast extract, AgNO3, methyl jasmonate and sorbitol), yeast extract and AgNO3 were the most effective elicitors to stimulate the tanshinones production. Moreover, cryptotanshinone was stimulated more significantly than tanshinone 2A by elicitation. Elicitors had no significant effect on root growth. Callus initiated in MS medium supplemented with IAA in combination with Kin was used for cell suspension culture experiments. Investigation of the effects of different biotic and abiotic elicitors including yeast extract, AgNO3, methyl jasmonate, sorbitol, salicylic acid and citric acid on tanshinones production in cell suspension cultures revealed the significant enhancement of cryptotanshinon at 200 mg/L YE treatment. Cryptotanshinone, tanshinone 2A and hydroxycryptotanshinone, were isolated and purified from the roots of *P. abrotanoides* using column chromatography and HPLC and their structures were confirmed by LC-MS and NMR experiments. Moreover, cytotoxicity and apoptosis induction of total root extract, cryptotanshinone, tanshinone 2A and hydroxycryptotanshinone, were investigated on normal and cancer cell lines (MCF-7 and HeLa). All of these compounds, especially hydroxycryptotanshinone and tanshinone 2A, exhibited cytotoxic effect, reduced cell viability and induced apoptosis in cancer cells. The apoptosis induction by total root extract and purified tanshinones in MCF-7 and HeLa cells was confirmed by PI staining, sub-G1 peak analysis and PARP cleavage.

**Biography**

Arehzoo Zaker received the PhD degree in plant physiology from department of biology at Ferdowsi University of Mashhad, Mashhad, Iran. She works part time at the Ferdowsi University of Mashhad. Her current research interests include micropropagation of medicinal plants, in vitro production of plant natural products, plant cell and tissue cultures and analyzing of pharmaceutical compounds in some endemic Iranian medicinal plants. Arehzoo is a member of Iranian Society of Biology and Iranian Society of Plant Physiology. She serves as a referee for Journal of Plant Reaserches.
Analysis of the genetic variability of the subgenus Quercus Oerst. in central and south Italy

Paola Fortini
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Fagaceae is the most important tree family of the central and southern European Mediterranean and temperate forests. Quercus comprises about 450 species in North and Central America, South-America, Eurasia, and northern Africa (Nixon 1993). Italy is the country showing the highest oak species diversity in Europe, although on the exact number of oak taxa to be considered as good species there is still not a complete agreement. This number, in fact, may range between 11 and 19, and is linked to the elasticity with which the various authors interpret the concept of species. The most of taxonomic uncertainty among the Italian (and European) oaks lies within the pubescent-oaks collective group (Quercus pubescens s.l.). Under this name there is a complex of strictly related taxa of deciduous white oaks (Subgen. Quercus, Sect. Quercus) that are native to southern Europe and southwest Asia and are currently widespread from northern Spain (Pyrenees) to Crimea and the Caucasus. In Italy the pubescent-oak forests are potentially dominant across a large range of climatic and soil conditions. The main Italian floras and checklists (Conti et al. 2005, Pignatti et al. 2017, Bartolucci et al. 2018) reports various pubescent-oaks in addition to Q. pubescens Willd although some of them are considered as doubtful taxa. These are Q. virginiana Ten., Q. dalechampii Ten., Q. congesta Presl, Q. amplifolia Guss., Q. leptotalana Guss., Q. ichnusae Mossa, Bacch. & Brullo, Q. humilis Mill., Q. apennina Lam. and are all classified as Steno-Mediterranean vicariant of Q. pubescens. It is well-known that genetic diversity determines the ability of a tree to adapt to changing environments and serves as the basis for maintaining long-term stability of forest ecosystems. The evaluation of genetic variance, therefore, could be of great importance for the conservation and management of forest ecosystems especially in isolated areas particularly vulnerable to the climatic change or in forests that have significantly reduced their original extension. Although genetic tools can be valuable means to plan long-term conservation or restoration project, is our opinion that the best strategy for the management of the oak woods starts with from the exact taxonomic identification of the dominant trees. The main objective, however, was to investigate the pattern of genetic diversity in pubescent-oaks in central and south Italy in order to provide useful information on the capability of individual tree species and populations to respond to possible environmental changes in terms of internal variability.
Integrated approach to investigate poplar roots response to mechanical constraints

Dalila Trupiano (Researcher), Ph.D., University of Molise; Elena De Zio (Post-Doc), Ph.D., University of Molise; Antonio Montagnoli (Researcher), Ph.D., University of Insubria; Donato Chiatante (Professor), Ph.D., University of Insubria; Karin Ljung (Professor), Ph.D., Swedish University of Agricultural Sciences; Gabriella Sierra (Post-Doc), Ph.D., University of Molise; Gabriella Stefania Scippa (Professor), Ph.D., University of Molise.

Roots are important to plants as they perform fundamental functions, such as nutrient and water uptake, anchorage and mechanical support. Several environmental factors, including alteration of gravity direction, touch, wind and bending, may induce a mechanical stress condition and strongly affect plant stability.

Progress has been made in understanding the physiological and molecular basis of root response to mechanical stress, especially in the model plant Arabidopsis thaliana, in which bending causes the initiation of lateral root primordia toward the convex side of the bent root (Ditengou et al. 2008; Richter et al. 2009). Conversely, knowledge in the case of woody roots are still poorly investigated due to intrinsic difficulties in excavation and sampling.

By using a simple experimental system to mimic bending stress in poplar woody roots (Populus nigra L.), we previously found that the intensity of tension and compression forces and the direction of gravity in bent woody roots can elicit specific responses, such as lateral root emission and reaction wood formation (Scippa et al. 2008; Trupiano et al. 2012a,b; 2013; 2014; Rossi et al. 2015).

To understand how these forces act along the woody taproot and across different sides of root, an integrated analysis was used. In particular, we investigated: 1) the anatomical response of bent stressed roots; 2) the role of principal phytohormones in modulation of mechanical stress response; 3) the molecular mechanisms which are involved in lateral root and reaction wood formation. Ours results showed that also in poplar woody taproot the mechanical stress elicit an asymmetrically response in the convex and concave side of bent root; these responses resulted modulated by activation of complex signaling, involving phytohormones (such as indole-3-acetic acid, abscisic acid, gibberellins, kinetin and ethylene) and different molecular factors (such as ethylene-responsive protein, CBS 1 protein, etc.), important to regulate processes such as reaction wood formation, lignin biosynthesis in the concave side and lateral root formation in the convex side of bent root (De Zio et al. 2016). Furthermore, the number of cambium cells measured in the concave side was significantly higher than the convex side. Thus, cambial zone and its surrounding areas were isolated from convex and concave sides of bent poplar root and analyzed by UHPLC-MS/MS to profile IAA metabolites, ABA and CKs.

In the concave side, IAA gradient plays a pivotal role in the control of cambial growth rate and xylem differentiation, and it could be at the basis of the strictly unidirectional RW production toward this side. Furthermore, the higher levels of ABA and all CKs metabolites in the concave side support their involvement in RW production, whereby ABA could mediate the adaptation to the deforming conditions generated by bending, while CKs could act in synergy with IAA to control cell differentiation (De Zio et al. 2019).

Biography

Dalila Trupiano is a Researcher in Plant physiology at Department of Biosciences and Territory - University of Molise (Italy). Her scientific interests are mainly focused on on the study of plant-environment interactions, and in particular on mechanisms involved in woody roots response to environmental stress conditions. Candidate genes approaches and qRT-PCR techniques are used to identify/characterize specific factors related to wood and lateral root formation. Furthermore, comparative proteomic analysis and phytohormonal metabolites profiling, coupled by morphological and anatomical analyses, are carried out in order to comprehend which biomolecules are specifically modulated under different stress conditions and during plant growth cycle.
Speech for the International Conference on Plant, Cellular, and Molecular Biology

Amanee Gordon
OpenEdge Inc. USA

1. Short Description of what will be discussed during the presentation

An in-depth biography of myself, the importance of nanotechnology in plant science and the real-world applications, and some encouraging words for young scientists matriculating into the science world.

2. What will the audience take away from your presentation?

Explain how the audience will be able to use what they learn?

The audience will be able to personally evaluate the need for nanotechnology in their laboratory or any laboratory setting they come into contact with. By using nanotech in the lab, the audience will understand the favourable impacts, which will make for life-changing discoveries.

How will this help the audience in their job? Is this research that other faculty could use to expand their research or teaching? Does this provide a practical solution to a problem that could simplify or make a designer’s job more efficient? Will it improve the accuracy of a design, or provide new information to assist in a design problem? List all other benefits.

Nanotechnology has so many applications that it could very well help the audience with their jobs. Research that can be expanded on surrounding nanotech include but certainly are not limited to: energy, medical, electronic, and material applications, to name a few. Adopting nanoscale practices provides more efficient results and cheaper material prices.

Biography

Amanee Gordon is a current chemistry graduate student, attending Tuskegee University. She graduated with a bachelors of science in animal science in May of last year, from the same university. Her primary research focuses on nanocellulose extraction for use in fabrication of cellulose-based nanocomposite materials. Amid her laboratory work you can find her painting or listening to music. Being from California, one of her favorite places to go is the beach. While pursuing higher education, her drive comes from her love for her community and her devotion to aid disenfranchised people. She strives to educate the uneducated and connect science with the general population.
Investigation of heavy metal contents in some medicinal plants of district sialkot, pakistan

Shamim Akhtar1, Muhammad Danish Jamil1, Nazneen Bangash2, Durr-E-Nayab1
Department of Botany, University of Gujrat, Gujrat, Pakistan

Medicinal plants are commonly used to treat various diseases, however contamination of medicinal flora with heavy metals is a great threat to human health. Present study was planned to evaluate the quantity of heavy metals such as Ni, Zn, Pb, Cd and Cr in whole plant samples of some of the most frequently used therapeutic plants of the district Sialkot, Pakistan. The rapid assessment technique involved interviews from local people and herbalists for collection of therapeutic plants. After acid digestion of samples; the heavy metal contents of studied medicinal plants (Achyranthes aspera, Parthenium hysterophorous, Cannabis sativa, Chenopodium album, Withania somenifera, Calotropis procera, Saccharum bengalense, Coriandrum sativum, Cucumis melo var argestris and Euphorbia thymifolia) were determined by using Atomic Absorption Spectrophotometer. These curative plants perform a significant role in the traditional medicinal system that were being used for long time for cure of diseases and constantly providing new and fresh products to new generation. Likewise, these useful medicinal plants are providing vital source of raw material for agricultural and pharmaceutical industries. The medicinal plant samples showed considerably higher heavy metal contents. Further, various concentrations of heavy metals (Ni, Zn, Cd, Cr and Pb) in studied therapeutic plants were in following order as Zn>Pb>Ni>Cd>Cr. The maximum values obtained for Zn, Pb, Cd, Ni and Cr (27.566, 16.74, 4.60, 4.846 and 3.42) ppm were compared with the safety standards suggested by the World Health Organization (W.H.O.) and it was concluded that medicinal plants samples exhibited higher heavy metal concentrations. So the collection of medicinal plants from polluted soil is not recommended.

Biography

I, Dr. Shamim Akhtar is working as Assistant Professor in the Department of Botany, University of Gujrat. I have completed PhD.Botany in 2013 from PMAS-Arid Agriculture University Rawalpindi Pakistan. My area of interest is Plant nutrition. I was a research student in the laboratory of Plant Biotechnology, University of Tokyo under the kind supervision of Prof. Dr. Naoko K Nishizawa. I have produced 5 Mphil students and 4 are under supervision. I have an HEC funded project related to ameliorative strategies for Fe deficiency in peanut and chickpea. My research work was published in various national and international journals. Current research paper is the thesis of my MPhil student Muhammad Danish Jamil. I hope this conference will be fruitful to interact with researchers across the globe and to collaborate with researchers of my field.
Title: The use of soybean lipoxygenase-1 as an innovative tool to study putative healthy effects of natural plant products

Mario Soccio, Maura N. Laus, Donato Pastore
University of Foggia, Italy

In recent decades, the study of Antioxidant Capacity (AC) of foods rich in antioxidants has raised considerable interest in the light of related positive effects on health of consumers. Many methods have been developed for in vitro AC evaluation, most of which have important limitations. These assays often use radicals and experimental conditions far from the physiological ones, and are able to estimate only one or a few of the various possible phytochemical protective actions against oxidative damage, resulting in difficulties in highlighting synergistic action among antioxidants. To overcome these weaknesses, we have developed two novel methods based on secondary reactions of the isoform-1 of soybean lipoxygenase (LOX), named LOX/4-Nitroso-N,N-dimethylaniline (LOX/RNO) and LOX-fluorescein (LOX-FL). In the primary reaction, soybean LOX-1 catalyses the incorporation of O2 into polyunsaturated fatty acids to give the corresponding hydroperoxide derivatives. Under conditions of limited oxygen, LOX-1 is also involved in several secondary reactions generating some physiological reactive species (alkoxyl, alkyl and peroxyl derivatives, HO• and 1O2) able to oxidize plant pigments as well as RNO and FL oxidation, respectively. AC of pure antioxidants, food extracts or biological samples may be assessed by evaluating the inhibition of RNO or FL oxidation rate and quantified by means of a proper calibration curve. These methods have a series of advantages: they use only physiological radicals, evaluate the oxidant-antioxidant competition at low O2 concentration (as it often occurs in target cells) and at the surface of a biological macromolecule (the LOX-1 apoenzyme) rather than in the bulk phase of the reaction mixture. Moreover, they may also evaluate simultaneously hydrophilic and lipophilic molecules in the same reaction medium, as well as phytochemicals acting as scavengers of different radicals, reducing agents or chelators of the non-heme Fe3+ necessary for LOX catalysis and direct inhibitors of the peroxidative reaction catalysed by LOX. This may provide a comprehensive AC evaluation, thus allowing to highlight very well the synergistic effects among antioxidants. All these conditions approach the cellular ones better than other methods. We have used LOX/RNO and, more recently, LOX–FL methods to dissect antioxidant properties of food grade antioxidants, cereal and pseudo-cereal grains, fruits, plant-derived foods and blood after intake of some of these foods. Different types of food extracts were usually studied (hydrophilic, lipophilic, both free and bound phenolic) and a comparison was carried out with the widely used TEAC and ORAC methods, able to highlight mainly reducing and peroxyl-radical scavenging activity, respectively. LOX-based methods were always found to be highly performing with respect to TEAC and ORAC. Recently, LOX-FL has been used for ex vivo AC measurements of human blood samples after short-and long-term intakes of some of these foods, and the effectiveness in improving serum antioxidant status was evaluated using the novel Antioxidant/Oxidant Balance (AOB) parameter, calculated as an AC/Peroxide Level ratio. An overview of data is presented.

Biography

Education
2015-2018 Assistant professor, Department of Sciences of Agriculture, Food and Environment, University of Foggia, Italy.
2008-15 Postdoctoral fellow, University of Foggia, Italy.
2008 PhD Degree (Doctoral) in "Sustainable Agricultural Ecosystems", University of Foggia, Italy.
2007 Visiting Doctoral Student, Department of Biology, University of Padua, Italy.
2005-08 Doctoral student in "Sustainable Agricultural Ecosystems", University of Foggia, Italy.
2003-05 Research fellow, Experimental Institute for Cereal Research, Foggia, Italy.
2003 "Laurea" (equivalent to master degree) in Food Science and Technology. University of Foggia, Italy.

Research activity
The research activity regards: a) durum wheat mitochondria bioenergetics and their role in the response to environmental/oxidative stress, with particular interest to mitochondrial dissipative systems; b) antioxidant activity of plant-food extracts and other biological samples, evaluated by means of lipoxygenase-derived methods.
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February 18 - 20, 2019 | Valencia, Spain

POSTERS
The seed-specific relative water content as a physiological trait to track the germination process in Ceiba aesculifolia seeds

M.S. Ximena Gómez-Maqueo, M.S. Sandra Alvarado-López, Ph.D Alicia Gamboa-deBuen, Instituto de Ecología, UNAM, México.
M.S. Ximena Gómez-Maqueo, Instituto de Ecología, UNAM, México

Functional diversity is partly reflected in seeds as the time it takes for the majority of the seeds in a population (batch) to germinate, and may confer advantages for seedling establishment in a wider range of environmental variations in both space and time. From an ecophysiological perspective, germination-timing diversity is a key trait, since the overlapping of this trait with the environmental heterogeneity allows the diversification of opportunities for plant recruitment within ecosystems. From a methodological perspective, this variability is a major deterrent for the understanding of the mechanisms that drive the interaction of the seeds with their environment, or any physiological process such as germination. This is particularly common in wild species, which can display differences in germination performance from year to year due to environmental and maternal effects. This also hinders the optimization of germination requirements for in-depth comparisons of seed physiology in these species. For both domesticated and wild species, water availability affects the rate and the fraction of a seed population that will successfully complete germination. In recent years, non-invasive seed-by-seed studies have confirmed that imbibition occurs gradually, in a spatial-temporal pattern until reaching a specific water threshold for radicle protrusion. The imbibition dynamic associated to the relative water content (RWC) characteristic to each phase might reflect a specific physiological state, independent from the intrinsic and extrinsic inputs of variation that contribute to germination timing. Thus, the RWC could be useful to track seed progression through the germination process for comparison analysis of seed batches that differ significantly in their overall germination time courses.

Methods: We tracked water uptake in individual Ceiba aesculifolia seeds and selected several RWC along the germination time course, for primed and untreated seeds from three independent seed batches. To test if the RWC reflected a specific physiological state in a time-independent manner, we analyzed the changes in the transcriptomes between physiological states and treatments, through de novo assembly of RNAseq reads.

Key Results: The seed batches tested had a positive response to priming by improving germination performance and by showing and advancement in the transcriptomic profiles commonly associated to the early germination processes described in model species such as Arabidopsis. Priming reduced the average time to germination, but did not alter the RWCs associated with each imbibition phase. Several genetic pathways previously described during the germination process were associated to each of the stages we determined through the RWC in control and treated seeds. With this approach, differential gene expression promoted by the priming treatment was detected.

Conclusions: The RWCs associated with the imbibition dynamic could be used as a population trait, which is a proxy of the seed-specific advancement through the germination process under the experimental conditions tested.

Biography

Ximena is a Ph.D. student at the Instituto de Ecología, Universidad Nacional Autónoma de México (UNAM). She obtained her masters degree at the same institute, while studying the germination performance and response to priming of C. aesculifolia seeds. Ximena currently studies the genetic regulation of seed germination in C. aesculifolia seeds, through RNAseq techniques, in order to understand the physiological responses of different seed lots to environmental stimulus such as water availability, which could help in the detection of key processes to improve germination and management of this species.
Somatic embryogenesis and plant regeneration in Japanese pines

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Yoshihisa Hosoi, Bachelor, Forestry and Forest Products Research Institute (FFPRI-Japan)

Japanese black pine (Pinus thunbergii), Japanese red pine (P. densiflora), Yakutanegoyou (P. armandii var. amamiana), and Ryukyu pine (P. luchuensis) are important native pine species in Japan used for reforestation and landscaping. However, these species are affected by various biological problems and need urgent measures for their propagation. Somatic embryogenesis (SE) is the most promising technique for mass propagation of clones, and for plant regeneration in genetic transformation protocols used in basic studies and in tree improvement programs. In this presentation we report recent progress in protocol development for SE in Japanese pines, including embryogenic cell induction, proliferation of embryogenic cultures, somatic embryo production, germination, and plant regeneration from somatic embryos.

Embryogenic cultures, initiated from megagametophytes containing zygotic embryos, were maintained and proliferated in a medium supplemented with 2,4-dichlorophenoxyacetic acid and 6-benzylaminopurine, sucrose, and glutamine. Then, somatic embryo maturation experiments were performed in darkness at 25°C, culturing the embryogenic tissues on maturation media containing maltose, activated charcoal, abscisic acid, and polyethylene glycol (PEG). The addition of PEG to the medium dramatically stimulated embryo maturation and resulted in an enhanced yield of mature embryos as the PEG concentration is increased. Supplementation of medium with 100-150 g l−1 PEG was found to be suitable for high-quality embryo production in Japanese pines. However, desiccation of somatic embryos after PEG-maturation was found to be essential for achieving both high germination and high conversion rates. In contrast, when somatic embryos of Japanese pines were matured on PEG-free medium but containing a high concentration of gellan gum, somatic embryos readily germinated without any post-maturation treatments.

**Key words**
Clonal propagation, Embryo desiccation, Gellan gum, Pinus, Polyethylene glycol, Somatic plants, Tissue culture

**Biography**
Researcher at the Forestry and Forest Products Research Institute (FFPRI-Japan). Graduated in Forestry Sciences, Doctor in Agriculture Science at the University of Tsukuba PhD Graduate School of Agriculture. Researcher at the FFPRI since 1996. Major research field in biotechnology of forest trees including organogenesis and somatic embryogenesis, propagation, improvement, and conservation of temperate and tropical woody species.
Soils naturally or anthropogenically enriched with heavy metals pose a significant problem worldwide and disturb ecosystems functioning by their toxic influence on all organisms. Polluted with heavy metals soils are colonized by specific plant communities, tolerant to enormous amounts of heavy metals – metallophytes. The Violaceae family is rich in metallophytes with a numerous species in the genus Viola L., especially in Melanium Ging. section. The impact of heavy metals on violets, including physiological processes, morphological and genetic variability, genome alteration, sexual reproduction, colonization by mycorrhizal fungi, metal accumulation in plant organs was the topic of long-term studies (e.g. Słomka et al. 2008, J Plant Physiol 165:1610-1619; 2011a, J Plant Physiol 168:1191-1199; 2011b, Chemosphere 83:435-442; 2012, Environ Exper Bot 74:204-211; Kuta et al. 2014, Plant Biol 298(2):445-455). Recently, a new model to study plant cell tolerance to heavy metals was developed, suspended cells of non-metallicolous and metallicolous Viola species (Sychta et al., 2018, Plant Physiol Bioch 132:666-674).

The aim of the current studies was to regenerate plants from the most tolerant to heavy metals cells of non-metallicolous Viola arvensis (Murray), a cosmopolitan species spontaneously inhabiting also polluted areas. Cell suspension was obtained from three-month-old callus induced from leaf fragments on solidified half-strength MS medium supplemented with 30 g L-1 sucrose and 2 mg L-1 2,4-D + 2 mg L-1 BAP, transferred to the liquid medium with the same plant growth regulators. In the exponential phase of growth, cells were treated with 2000 μM of Zn or 2000 μM of Pb for 72 h. Cell suspension culture without heavy metals was the control. After 72 h survived cells were maintained on solidified medium to induce cell divisions and callus proliferation. After 5 weeks callus tissue was transferred on medium supplemented with 0.5 mg L-1 TDZ to induce organogenesis. Rooting of adventitious shoots was on medium with 1 mg L-1 IBA. After four weeks, regenerated plants were acclimatized and introduced to field conditions. Pollen viability of regenerants and initial plants was determined using Alexander test. The genome size of initial plant, regenerated shoots, and callus tissue (obtained from cells after treatment with heavy metals and from non-treated cells) was estimated by flow cytometry. The genetic diversity of regenerated plants and their identity with initial plant and other plants from natural Polish populations was determined by ISSR molecular markers.

Results revealed that: 1) Survived cells after treatment with high concentrations of Zn or Pb were dividing and forming organogenic callus; 2) Regenerated shoots possessed the same genome size as initial material, indicating lack of genome duplication under the impact of heavy metals and/or culture conditions; 3) Regenerants growing in field conditions were vigorous and reproduced sexually (developed viable pollen and set seeds); 4) Genetic diversity of regenerated plantlets covered in a large extent the range of the variability of V. arvensis from the natural populations.

Conclusion: Successfully obtained regenerated plants from highly tolerant to zinc and lead cells could be considered as a good source of material for recultivation of polluted areas.

This study was supported by the National Science Centre [grant number: 2017/27/N/NZ8/00949].

1. What will the audience take away from your presentation? (Try to list 3-5 specific items)

- The poster presentation will be ensures the informations about the abilities of single cell coping with heavy metal stress
• Audience gain a new knowledge about behaviour of single cells in suspension and their capability to survive and division in respect to heavy metals of semi-tolerant species, little is known about the tolerance of single plant cells to heavy metals.

• The poster presentation shows the good way to obtain more tolerant plant of particular species which will be useful to introduction them to polluted areas.

6. Is this abstract connected to an organized session? If yes, please provide full session title.

Plant Science and Plant Research: Plant stress responses

Biography

2015 - Master Degree at the Jagiellonian University, Faculty of Biology and Earth Sciences

2015 - until now - doctoral studies at the Jagiellonian University, Faculty of Biology

My research interests focus on heavy metal influence on cells in suspension culture e.g. cell viability, programmed cell death, heavy metal accumulation and ability to regenerate highly tolerant plants from the most tolerant cells. I am a co-author of 7 scientific papers also concerning the topic presented in poster e.g. Sychta et al., 2018, Plant Physiol. Biochem., 132:666-674; Sychta et al., 2017, Acta Soc. Bot. Pol., 86(3):3555.

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Category: Poster Presentation

Session Name: Plant Science and Plant Research

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Evaluation of drought stress in germinating Opium poppy

Jiri Cerven, Ph.D., University of Ostrava, Martin Bartas, University of Ostrava, Kristyna Kundratova, University of Ostrava, Petr Pecinka Ass. Prof., University of Ostrava.

In our work we have evaluated transcriptome profiles of two different lineages of Opium poppy germinating for four weeks under regular and drought stress conditions. Drought tolerant and drought sensitive lineages were compared at four different time-points to identify genes, that are differentially expressed. This comparison helped us to gain insight into drought stress tolerance in Opium poppy during early germination, where plants are most sensitive to drought stress. Dehydrin content, stability and accumulation was also evaluated in all samples, to evaluate correlation between gene expression and draught-stress protein concentration in different lineages. These results will be used for more focused studies on different lineages and will be used for future breeding strategies.

Biography

Jiri Cerven, Ph.D., University of Ostrava. Focusing on biosensors, biodegradation, DNA-protein interactions and NonB-DNA structures. Currently starting to work on Opium poppy transcriptomics and Opium poppy breeding.
Distribution of mercury in sediments and plant tissues of Rhizophora apiculata and Rhizophora mucronata at Matang Mangrove Forest Reserve, Malaysia

Giovanna Wolswijk¹, Dr. Behara Satyanarayana², Dr. Le Quang Dung³, Yin Fui Siau⁴, Ahmad Nazila Bin Ali⁵, Ibrahim Sunkanmi Salii¹, Muhammad Amir Bin Fisol⁶, Prof. Dr. Cristina Gonnelli⁶, Prof. Dr. Farid Dahdouh-Guebas¹,⁴
¹ Université libre de Bruxelles (ULB), ² Universiti Malaysia Terengganu (UMT), ³ Università degli Studi di Firenze (UNIFI), ⁴ Vrije Universiteit Brussel (VUB)

E

stuarine mangroves can act as an important sink to the heavy metals by storing them in sediment and plant tissues. Among several metals, mercury (Hg) is one of the most hazardous, due to its toxicity, high mobility and long persistence in the environment. Globally, the problem of Hg emission is of great concern for human health due to increased anthropogenic activities.

Matang Mangrove Forest Reserve (MMFR) in Malaysia is under a systematic silvicultural management since 1902 for the production of mangrove charcoal. However, the impact of charcoal industries, along with increased human activities, in the vicinity are believed to raise the pollution and importantly, the Hg presence to risk both environment and humans. The limitations such as no regular monitoring on pollution and very few scientific studies on Hg at MMFR makes the present study highly relevant.

The main objectives are to investigate Hg pollution in different mangrove tissues and surface sediments and establish a gradient from the plausible point sources (i.e. charcoal factories and nearby industries) to the river mouth.

Sampling was conducted in June and July 2018 from ten sites. The samples collected from each site include leaves (four stages - young, mature, senescent and decomposing), bark and roots of the dominant species Rhizophora apiculata (Blume) for up and midstream sampling sites and Rhizophora mucronata (Lamk.), for sampling sites at the river mouth. In addition, sediments were collected from river bank and inside the forest. All samples were preserved in an ice-box and transferred to the laboratory for further processing and analyses, where they were stored at -20°C.

Sample preparation was done by freeze-drying the samples and grinding them to fine powder with mortar and pestle. The concentration of Hg in each sample was detected using a mercury analyzer MA3000 (Nippon Instruments Corporation, Japan).

Among the plant tissues, Hg was found mostly in the leaves, indicating a major influence of atmospheric deposition. The concentration of Hg in other plant tissues (i.e. bark and roots) was close to zero or under the detection limit of the mercury analyzer. Mercury within the four types of leaves was in the order of decomposing leaves > senescent leaves > mature leaves > young leaves. As the interpretation of our results is still in progress, more scientific insights are expected to be available in a few months.

Outcome

• Not many studies are available on Hg accumulation in different mangrove tissues and there were no in-depth studies on Hg pollution at the MMFR. Therefore, this study would be able to provide several scientific insights in relation to the environment and human health.

• Present results indicate no Hg accumulation in the root or bark tissues, whereas its presence in the leaves is most likely due to atmospheric deposition.
The present study is not only useful to understand the impact of Hg at the MMFR, but also able to serve as a (recent) strong base-line data for others (e.g. other mangrove forests managed for charcoal production) and on Hg accumulation in plant parts of Rhizophora spp.

Taking the present investigation into account, future research on Hg pollution and its bioaccumulation into the food chain are possible.

Biography

Giovanna Wolswijk (born in Poggibonsi, Italy on 24/10/1995) completed her under graduation in Biological Sciences (BSc degree) with 110/110 cum laude from UNIFI (Italy). She carried out a thesis entitled, “Analysis of the effect of trivalent chromium on freshwater green algae”, under the supervision of Prof. Dr. Alessio Papini; the results of this study were presented in the 13th Multinational Congress of Microscopy, Rovinj (Croatia) (September 2017).

Currently Giovanna is pursuing her MSc study in Tropical Biodiversity and Ecosystems (TROPIMUNDO) – an Erasmus Mundus Excellence course coordinated by the ULB (Belgium). After the first semester at UNIFI, Giovanna enrolled for her second semester at the UMT (Malaysia) and finalizing her master's thesis project on mercury pollution in mangroves.
Effect of flavonoids on mycorrhizal synthesis between Lactarius deliciosus and Arbutus unedo L. in vitro plants

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Arbutus unedo L. known as strawberry tree is a Mediterranean species adapted to different lithological conditions, degraded soils and moderate climate stress. The species contributes to the increase of biodiversity and has been used in areas of forest for the reduction of fire propagation. This is due to its low level degree of combustibility and its capacity of regeneration after forest fires occurrence. Producers use the fruits for the production of a spirits, called “Medronheira” and more recently for fresh fruit consumption. The fruit, red, occurring in autumn has a high content of antioxidants and vitamin C.

The application of mycorrhizal fungi in plants is used to increase the acclimatization rate of micropropagated plants, resistance of plants in the nursery, favouring survival in field conditions and ulterior tolerance to biotic a and abiotic stresses. Moreover, some associated mycorrhizal fungi can produce edible mushrooms increasing the yield of the landowners, as it is the Lactarius deliciosus.

The flavonoids produce a diverse array of plant compounds with various functions as UV protection, auxin transport regulators, defence compounds against pathogens and in root–rhizosphere signalling in symbiosis, in particularly for the interaction between roots and microorganisms. In this work, we test the effect of the addition of a flavonoid - quercetin, on mycorrhization and on the development of micropropagated plants.

Two clones were tested during the ex vitro rooting phase simultaneously with acclimatization. As mycorrhizal fungi a vegetative inoculum of Lactarius deliciosus was tested. Perlite was used as substrate, with five levels of quercetin (0.5 - 10.0 μM, compared to control) mixed in water or in Knop’s culture medium. The results showed that the rate of mycorrhization depends on the genotype, the concentration of quercetin and the culture medium. The best results were observed when level one of quercetin (0.5 μM) was used, with no significant differences from level two (2.0 μM).

Biography

Lecturer at the Coimbra / ESAC, Graduate in Forestry with master’s and PhD in Plant Biology.
Professional career began as a teacher of Soils and Fertility (1982-85).
From 1985 to 1995 worked in the area of tree breeding and plant propagation at Portucel Florestal.

Since 1995, at ESAC as a teacher in the Forestry Department. Since 2005 has been working on plant breeding of Arbutus and Chestnut. Since 2012 has been collaborating in research and development projects (ProDeR, FCT, PDR2020), with several partners, to improve vegetal material and cultural practices, collaborating with Research & Development Entities, Associations and Forest Producers.

Forestry Department, ESAC, 131 years of planting for the future, www.esac.pt
Coimbra Polytechnic Agriculture School. www.ipc.pt
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The role of photosynthetic pigments in seeds differing in resistance to desiccation

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Aleksandra Maria Staszak, Ph.D., Department of Plant Physiology, Institute of Biology, University of Białystok, Białystok, Poland
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Seeds are usually considered in the context of generative plant reproduction, rarely as the photosynthetic tissue. However, the seeds of many plant species are green, at least during their early development, so it seems logical to investigate the importance of this greening for seed development. Photosynthesis has not been fully studied in seeds. During photosynthesis, the production of reactive oxygen species (ROS) occurs, which can lead to oxidative stress and deterioration of seed quality. Carotenoids perform an auxiliary function in photosynthesis and protect against the destructive effects of singlet oxygen. In order to verify the possibility of removing ROS by carotenoids, this pigments fraction was tested for their total antioxidant capacity (TAC). The ratio of carotenoid to chlorophyll content (Car/Chl) is regarded as a marker of seed tolerance to stress factors. The higher the Car/Chl value, the better the resistance to stress. Therefore, the aim of the research was to determine the ratio Car/Chl and to determine whether this parameter reflects the resistance and sensitivity of seeds to the stress of water loss.

Seeds of three tree species differing in resistance to desiccation were selected: seeds of Norway maple (Acer platanoides L.) which are resistant to desiccation (orthodox), sycamore (Acer pseudoplatanus L.) seeds which are sensitive to desiccation (recalcitrant) and common beech (Fagus sylvatica L.) seeds presenting intermediate behaviour (intermediate). Mature seeds of these three species also differ in their colour: the seeds of both maples are green and the seeds of beech are yellowish. Both species of maples produce seeds every year, while beech seeds are produced at 5-10 years intervals, therefore they need to be stored. Stored seeds age and ROS accumulation is strongly linked to seed aging. Therefore, studies based on stored beech seeds, with an emphasis on the carotenoids fraction and their antioxidant capacity were performed to determine whether the carotenoid pool decreases along with storage time and with their ability to counteract oxidative stress.

Biography

I'm graduated from Adam Mickiewicz University in Poznań (Poland), Faculty of Plant Physiology. During my master thesis, I focused on the influence of arbuscular mycorrhiza on the expression of selected genes of nitrogen metabolism in maize during drought and rehydration. I'm a Ph.D. student at the Institute of Dendrology in Kórnik (Poland). My Ph.D. study is related to issues associated with seed physiology at the important developmental stages including maturation, dehydration and desiccation and germination.
The CRK5 kinase negatively controls senescence-related genes during plant development

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A characteristic feature of vascular plant genomes is a presence of a large family of cysteine-rich receptor-like kinases (CRKs), with 44 members in Arabidopsis thaliana. They are composed of external domain containing two copies of conserved, cysteine-rich C-X₈-C-X₂-C motif, transmembrane domain and internal domain with serine-threonine kinase activity. It is expected that cysteine residues in extracellular region of these proteins might form disulphide bridges, acting as sensors for reactive oxygen species (ROS) via redox regulation. One member of this family, CRK5 serves as a negative regulator of leaf aging. The 5-week old crk5 recessive mutant plants showed increased ethylene production and chlorophyll degradation, whereas restriction of gas exchange resulted in enhanced photorespiration compared to wild type. The phenotype was reverted in complementation lines. The structure of CRK5 promoter suggests that its expression might be under control of WRKY transcription factors. In fact, data obtained from next generation sequencing-based genomic profiling of aging crk5 plants revealed a clear upregulation of many WRKY and senescence-related genes, especially SAG12, SAG13 and SIRK.
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ORAL SPEAKERS
Plant defense genes: structural diversity and applications

M.Sc. Carlos André dos Santos-Silva; Dr. Marx Oliveira de Lima; Dr. Lívia Maria Batista Vilela; Dr. João Pacífico Bezerra Neto; Dr. José Ribamar Ferreira Neto; M.Sc. José Diogo Cavalcanti; Dr. Roberta Lane de Oliveira Silva; M.Sc. Caroline de Jesus Pires; Dr. Flavia Figueira Aburjaile; Biol. Marianne Firmino de Oliveira; Dr. Silvany de Souza Araújo; Prof. Dr. Ana Christina Brasilheiro-Vidali; Prof. Dr. Ederson Akio Kidô and Prof. Dr. Ana Maria Benko-Isepon

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Most omics data available in public databank regard cultivated plants from non-tropical regions, mainly regarding herbaceous plants. Brazil is recognized as the country with the highest biodiversity on the planet. In the case of plants, for example, most species unknown to science occur in this country. Besides, only 1% of the described plant species have been exploited, making it easy to imagine the potential of the Brazilian biota to be known and rationally used. Thus, there is an uncharted chemical patrimony, with innumerable medicaments, food products, biofertilizers and agrodefensives, cosmetics, solvents, oils, biomaterials and renewable energy sources, as well as an almost infinite number of molecules. In this context, the Brazilian Northeastern region stands out because it shelters the largest variety of ecosystems in all regions of Brazil, being considered one of the world’s biodiversity centers. Ongoing omics approaches developed by our group include data regarding of native and cultivated plants of Brazil northeastern region. Data generated include species as Vigna unguiculata, Cenostigma pyramidallis, Calotropis procera, Stylosanthes scabra, Vitis spp.; Manihot esculenta, and Cajanus cajan. Emphasis will be given on PR (Pathogenesis Related) genes of the classes PR-11, PR-12 and PR-13, that include antimicrobial peptides (AMPs). We have generated 72 RNA-Seq libraries (case-control-replicates) regarding the four first taxa (V. unguiculata, C. pyramidallis, C. procera, and Vitis spp.) under different treatment conditions (biotic/abiotic stresses) which were sequenced using Illumina Hi-Seq paired-end. For M. esculenta and C. cajan available genome sequences (Phytozome) were evaluated and validated using lab experiments (amplification from genomic DNA and expression validation by RT-qPCR from cDNA). A significant number of peptides was detected using AMP-Identifier (a software developed by our group) based on AMP models available at CAMPR3. Retrieved sequences were further evaluated and curated using Regular Expression (REGEX) or Hidden Markov Model (HMM). Selected curated sequences were further evaluated using a bioinformatics pipeline developed by our group (Santos-Silva et al. in press). Most annotated categories include Defensins, Snakins, Lipid Transfer Proteins and Heveins. Most promising AMPs were selected for in silico modelling (model-based or ab initio), molecular dynamics simulation and lab experiments against human and plant pathogens. The state of art and perspectives will be presented.

Biography

Bachelor in Biological Sciences, with Ph.D. in Natural Sciences (Plant Genetics) at the University of Vienna (Austria, finished in 1992). Carried out two post-doctoral research projects, one at the Universidade de São Paulo (São Paulo, Brazil) and other at the Johann Wolfgang Goethe University (Frankfurt, Germany). Works at the Universidade Federal de Pernambuco since 1994, where actually occupies the position of Full Professor, Head of the Laboratory of Plant Genetics and Biotechnology. Main research areas include plant genomics, transcriptomics, bioinformatics, molecular and cellular biology, including both native and cultivated plants and also their pathogenic and symbiotic microorganisms.
FT-IR spectroscopy combined with Principal Component Analysis allows studying in situ molecular processes involving cellulose, hemicellulose and pectin in plant cell walls during plant cell evolution

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Our aim is to discuss how mid-infrared Fourier transform micro-spectroscopy together with an original combination of multivariate statistical data analysis techniques allows highlighting and monitoring the molecular processes involving cell wall polysaccharides (cellulose, hemicellulose and pectin) in plant cell walls.

Mid-infrared absorption spectra can be acquired in situ at different sampling times during plant cell evolution, using a specific surface-sensitive technique (Attenuated Total Reflection – ATR) which takes advantage of the low penetration depth of the infrared beam inside the sample at the contact surface of a high-refraction index material with the sample itself. No previous sample treatment is required, hence the native cell wall structure and the natural biological variability are preserved.

FT-IR data analysis is based on Principal Component Analysis: the score-score plots allow to visualize the relationships among absorption spectra while the loading plots allow to identify the spectral bands responsible for the grouping and differences highlighted in the score plots.

Examples of our previous studies on wild type and transgenic Petunia hybrida and on grapevine berry skin from the onset of ripening to complete ripening and during the withering process in post-harvested berries will be presented.

The proposed approach is based on the assignment of the absorption bands to specific molecular bonds as reported in the literature concerning similar biological systems. With no need of quantification, PCA applied on normalized FT-IR spectra allows studying the evolution over time of the polymer structure and composition through the relative changes in absorption bands. These reflect the changing patterns of molecular bonds, which have structural and biochemical implications and are not solely related to an increase or decrease in the amount of a certain compound.

Additionally, the localization of polymers through immunolabeling experiments, that allow to reveal target polymers in situ using specific probes (e.g. antibodies), has proven to be a valid support for the interpretation of FT-IR results, allowing increasing the amount of information useful to understand plant cell wall structure and evolution.

Biography

Associate Professor (since 2005) in Experimental Physics at the University of Verona; PhD in Physics in 1993. After the initial research activity in Theoretical Physics, she worked in Experimental and Applied Nuclear Physics at various Laboratories (INFN Legnaro and Frascati, Italy; ESRF Grenoble, France), especially regarding condensed matter as well as biological and biomedical studies by Proton Induced X-ray Emission (PIXE) and Extended X-ray Absorption Spectroscopy (XANES and EXAFS with Synchrotron Radiation (SR)). Since 2005, she performs and coordinates the research activities at the IRIS-lab (Infra-Red for Interdisciplinary Studies) of Verona University, mainly devoted to biological applications of FTIR spectroscopy. Since 2016 she returned on SR research devoted to studying biogenic Selenium nanoparticles through XANES, EXAFS and X-ray micro-fluorescence.
Biofortification of common bean through phytic acid reduction

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Common bean (Phaseolus vulgaris) seeds have a high content of essential minerals such as iron, zinc and calcium that are important in the diet, however these minerals are scarcely bioavailable. For this reason, this species was chosen by the HarvestPlus program, an initiative of the Consultative Group for International Agricultural Research (CGIAR), as one of the target species to be iron biofortified. Poor mineral bioavailability is caused mainly by the presence of high content of phytic acid (myoinositol-1,2,3,4,5,6-hexakisphosphate; InsP6). This compound is a strong cation chelator of mono and divalent cations, such as iron, zinc, magnesium and calcium, essential minerals in the diet, reducing their bioavailability, since phytase enzymes are not present in monogastric animals, including humans.

One of the strategies proposed to increase the bioavailability of minerals is the development of low phytic acid (lpa) mutants. We have isolated a number of lpa mutants in common bean and we have well characterized the lpa1 mutation which affects the PvMRP1 (P. vulgaris multidrug resistance-associated Protein 1) gene, that, together with its paralog PvMRP2, encode putative vacuolar phytic acid transporter, belonging to the plant ATP-binding cassette (ABC) transporters cluster C (ABCC). The lpa1 beans have been proven to be effective for providing more bioavailable iron, however we have recently observed that the reduction of phytic acid may cause unexpected nutritional phenotypes. In particular we found that the lpa1 mutation affect the thermal stability of phytohemagglutinin-L, a the bean seed lectin, which become very stable and may cause severe gastrointestinal side effects.

Biography

Dr. Francesca Sparvoli is an expert in the field of grain crop seed nutritional quality research. She has a solid experience on biochemical and molecular aspects related to seed quality. She contributed with studies related to Phaseolus species seed storage proteins (elucidation of the mechanisms involved in seed proteins synthesis, modification, transport in the endomembrane system and accumulation in the vacuole of seed cells) and to seed biofortification (development of low phytic acid - lpa - mutants, elucidation of the mechanisms linking perturbations of phytic acid pathway and associated metabolic pathways to crop performance in limiting conditions).
The Growing Cannabis Community - history, innovations, and the future

Jessica Kristof, Alisha Holloway, PhD Mowgli Holmes
PhD - Phylos Bioscience

Government regulations around the globe have dramatically shaped the scientific, agricultural, and industrial evolution of cannabis. The discovery of tetrahydrocannabinol (THC), understanding the complex cannabinoid and terpene synthase pathways, unique industrial applications, and the treatment of epilepsy with cannabidiol (CBD) are a few of the primary drivers of scientific advancement. In a greater context, cannabis science remains 80 years behind other agricultural crops. To date, there has been little achievement in advancing science in the genetic and agricultural space. Recognizing this void, Phylos Bioscience has dedicated its team of scientists to an in-depth analysis of the cannabis genome. Our initial attempts to aid the scientific community began in 2014 with an ambitious project in collaboration with the Museum of Natural History — mapping the cannabis genome and unraveling the genetic story behind individual cannabis varieties. We created a public tool called the Phylos Galaxy as a way to bring visibility, transparency — and ultimately consistency — to the cannabis industry and consumer.

The Phylos Galaxy is a 3D map of cannabis, featuring thousands of varieties from over 80 countries, spanning 140 years. People around the world use the Phylos Galaxy to better understand the identity, ancestry, evolution, and genetic relationships of the cannabis they grow and use. With grower permission, Phylos submits sequence information to the National Center for Biotechnology Information (NCBI) and the Open Cannabis Project (OCP). This genetic information has been made available and continues to grow for all to utilize.

Finally, with this data Phylos is empowered to develop products that enable consumers, farmers, breeders and scientists to better understand where cannabis has been and where their variety of interest may be going. By partnering with breeders Phylos is now developing novel growing techniques, equipment and methods to be employed at multiple stages of the life cycle. By implementing capabilities Phylos has built for genetic, transcriptomic, epigenetic and phenotype analysis we help breeders to understand how successful their plant development programs are and suggest further routes for development.

Biography

Jessica Kristof was a Clinical Development Scientist specializing in quantitative PCR at MolecularMD, and Staff Scientist at Synthetic Genomics Inc. Her past work has focused on biofuels, oncology and now cannabis genomics. She holds multiple patents, and has degrees in both Biochemistry and Horticulture from Oregon State University.
Independent Evolution of Korean Weedy Rice

Patrick Vigueira, Ph.D. and Cindy Vigueira, Ph.D.  
Cindy Vigueira, Ph.D., High Point University

Red rice is an aggressive, weedy form of cultivated rice (Oryza sativa) that infests crop fields and is a primary factor limiting rice productivity in the United States and worldwide. As the weedy relative of a genomic model species, red rice is supremely suited to serve as a model for understanding the genetic and evolutionary mechanisms by which weediness evolves. Previous work has focused on the evolution of weediness in red rice from the southern United States which resulted from de-domestication events from both Indica and Aus cultivars. Here we use a genomics approach to explore the evolution of weedy rice in Korea. We find that Korean weedy rice evolved from two independent de-domestication events from Japonica and Indica cultivars. Low levels of genetic diversity found in Korean weeds likely results from population bottlenecks during de-domestication. The repeated evolution of weedy traits during these four independent events allows for a unique opportunity to explore the genetic mechanisms that can underlie de-domestication and lead to weediness.

Biography

Dr. Cindy Vigueira is an Assistant Professor of Biology at High Point University, North Carolina, USA. She runs a research program focused on plant evolution and plant breeding. Dr. Vigueira teaches courses in Cell and Molecular Biology, Genetics, and Domestication.
The phloem as a vascular integrator of whole-plant growth and development

ZIV SPIEGELMAN, Ph.D., The Hebrew University, AYELET OMID, Ph.D., The Hebrew University, SUMITA OMER, Ph.D., The Hebrew University, AMIT SHAHAR, The Hebrew University, SHMUEL WOLF Ph.D., The Hebrew University

The development of higher plants as supracellular organisms requires coordination between distant organs. To adjust the developmental pattern and rate under variable environmental conditions, the operation of a communication network enables synchronized growth and appropriate responses to external signals. It has long been established that small molecules such as plant growth substances and small peptides can act as regulators of developmental processes and plant responses to biotic or abiotic stresses. However, the role of macromolecules such as proteins or RNAs in the short- and long-distance plant communication network is a relatively new discovery.

The role of a phloem mobile proteins and RNA molecules in coordinating shoot and root development will be demonstrated.

The tomato (Solanum lycopersicum) diageotropica (dgt) mutant is auxin-insensitive, characterized by pleiotropic phenotype including lack of geotropism, malformed secondary xylem vessels, short roots and lack of lateral roots. Mapping of the dgt mutation established its location in the tomato Cyclophilin1 (SlCyp1) gene. Reciprocal grafting experiments between VFN8 wild-type and dgt mutant tomato plants established that SlCyp1 protein traffics from the scion to the stock resulting in restoration of vascular development and lateral root initiation. Transcriptome analysis suggests that the long-distance trafficking of SlCyp1 gene product acts to modulate auxin response in roots by suppressing transcription of a distinct set of NAC-domain genes. This family of plant-specific transcription factors controls multiple developmental processes, specifically lateral-root formation, xylem development and auxin response.

We proposed that SlCyp1 trafficking from the shoot could play a quantitative role in optimizing resource allocation between the shoot and root systems in response to altered environmental conditions. To test this hypothesis, plants were subjected to a series of photosynthetic photon flux densities (PPFDs). This set of experiments established that both accumulation of SlCyp1 in source leaves and its long-distance trafficking are stimulated by PPFD and these findings are tightly correlated with the regulation of root growth and concomitant adjustment in the shoot-to-root ratio.

Collectively, our results support the notion that long-distance trafficking of SlCyp1 acts as a rheostat to control shoot-to-root ratio, by mediating root development to integrate photosynthesis and light intensity with requirements for water and mineral nutrients.

Biography

Prof. Shmuel (Shmulik) Wolf received his Ph.D. in Plant Physiology in The Hebrew University of Jerusalem. He did his Post-doctorate in Plant Biology at the University of California, Davis and spent time there as a Visiting Professor. Prof. Wolf joined the Robert H Smith Faculty of Agriculture, Food and Environment in 1990. His research interests include phloem biology and studying the factors affecting the productivity and yield accumulation of vegetables and field crops. He served as the Director of the Otto Warburg Minerva Center for Agricultural Biotechnology from 2002 to 2009, as a Vice dean for Research from 2008 to 2012, and as the Dean of the Faculty from 2013 to 2017.
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February 25-27, 2020
Rome, Italy

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