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GLOBAL CONFERENCE ON

AGRICULTURE AND HORTICULTURE

Sept 30-OCT 01, 2021

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AGRI 2021

BOOK OF ABSTRACTS

GLOBAL CONFERENCE ON

AGRICULTURE AND HORTICULTURE

SEPT 30-OCT 01, 2021

Theme:

To Accomplish over the Global Challenges of Agriculture

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About MAGNUS GROUP

Magnus Group (MG) is initiated to meet a need and to pursue collective goals of the scientific community specifically focusing in the field of Sciences, Engineering and technology to endorse exchanging of the ideas & knowledge which facilitate the collaboration between the scientists, academicians and researchers of same field or interdisciplinary research. Magnus group is proficient in organizing conferences, meetings, seminars and workshops with the ingenious and peerless speakers throughout the world providing you and your organization with broad range of networking opportunities to globalize your research and create your own identity. Our conference and workshops can be well titled as 'ocean of knowledge' where you can sail your boat and pick the pearls, leading the way for innovative research and strategies empowering the strength by overwhelming the complications associated with in the respective fields.

Participation from 90 different countries and 1090 different Universities have contributed to the success of our conferences. Our first International Conference was organized on Oncology and Radiology (ICOR) in Dubai, UAE. Our conferences usually run for 2-3 days completely covering Keynote & Oral sessions along with workshops and poster presentations. Our organization runs promptly with dedicated and proficient employees' managing different conferences throughout the world, without compromising service and quality.

About AGRI 2021

Magnus Group welcomes you to our Online Event entitled "Global Conference on Agriculture and Horticulture" AGRI 2021 scheduled on September 30 to October 2, 2021 with the theme "To Accomplish over the Global Challenges of Agriculture"

AGRI 2021 is an international platform that amalgamates world renowned experts of both academics and industries within the discipline of Agriculture and Horticulture from all over of the world. This event brings together all the plant science scientists, botanists, and agronomists to exchange and innovates new theories and practices of Agriculture and Horticulture

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KEYNOTE FORUM

DAY 1

GLOBAL CONFERENCE ON

AGRICULTURE AND HORTICULTURE

SEP 30-OCT 01, 2021

AGRI 2021

Frederik Botha

Crop Science, Queensland Alliance for Agriculture & Food Innovation, The University of Queensland, St Lucia QLD 4072, Australia

Insight into the supply and demand functions of the sugarcane culm

The C4 grasses such as sugarcane, sorghum, Napier grass and Miscanthus hold much promises as feedstock for bioenergy production due to their high biomass yields. Most of the harvestable biomass in these species is the culm which could represent up to 75% of the total aboveground mass. The process by which grasses produce, transport, and store carbohydrates underpins all aspects of yield traits. The rate of gain in yield potential for many of the grasses has been slowing despite the overall increase demand for more biomass. In sugarcane, despite significant research investment, progress to increase biomass and sucrose yield over the past three decades have been negligible. In fact, production costs and production statistics are reflecting decreased yields globally. In all cases, increased production is linked to expansion of production area rather than to increases in yield. In all the grasses there is a strong correlation between culm length, internode length and aboveground biomass. Internode elongation is controlled by, developmental and environmental factors such as temperature and water. Only the top internodes of the culm can elongate and increase in size. Biomass production in grasses is directly related to the physiology of sink–source dynamics and whole-plant carbohydrate partitioning. What constitutes sink strength, or the magnitude of the 'demand function', have been long standing arguments. However, it is widely accepted that it is the competitive ability of an organ to import photoassimilates and that this is the product of the sink size and sink activity.

Sugarcane represents a specific case where the supply of sucrose to the parenchyma cells in the culm occurs primarily through symplastic offloading. The data presented in this paper provide insight into the three most important components of the 'demand' function in the internode, namely, use of sucrose for biosynthesis (cell wall and other cellular constituents), respiration, maintenance of a favourable water potential gradient to ensure growth expansion, and carbohydrate accumulation. All these components can be viewed as specific competing 'demand' functions on the supply of sucrose to the internode. However, the data suggest that sucrose accumulation is a weak demand function and probably only reflects a cessation of sugar utilisation to support growth and maintenance. There are two important processes at play in controlling internode expansion. The duration of internode elongation is controlled by degree days with a base temperature of 16-18oC (DD_{16-18}). Internode elongation stops after 150-180 (DD_{16-18}) and is strongly linked to with secondary cell wall and lignin deposition. The rate of internode elongation is dependent on biotic (metabolite and enzyme activities) and abiotic factors such as temperature and water. Size of the internode is the primary determinant of the biosynthetic and respiratory demand function in the sugarcane culm. The data enables the interpretation of most of the published and experimental data on genetically modified sugarcane, growth experiments, carbon partitioning in the culm, and agronomic performance of the crop. It also highlights that achieving biomass yield gain and high sucrose content in sugarcane are opposing objectives.

Audience Take Away:

- Despite the growing interest, and importance of biomass derived from the grasses, progress to increase biomass yield from these species has been very slow. This presentation highlights the importance of specific demand functions in the sink tissue and how these interact to control biomass yield and biomass composition.
- Crop yield is directly linked to the control of source sink relationships in plants. However, the control of carbon partitioning in tissues other than seeds and fruits are still poorly understood. This presentation highlights the complexities associated

with a sink tissue that is primarily loaded through symplastic transport.

- The presentation highlights the importance of having a sound understanding of the biological system before deploying high-tech technologies such as genetic manipulation or gene editing to alter performance and composition of plants.
- The work provide insight as to why most attempts to increase sucrose and biomass yield in sugarcane through breeding and biotechnology have failed.

Biography:

Frederik (Frikkie) Botha is currently a Professorial Research Fellow at the Queensland Alliance for Agriculture & Food Innovation, University of Queensland, Australia. Previous roles include Executive Director of the Sugar Research Development Corporation, Australia, Director the Sugarcane Research Institute, and Institute for Plant Biotechnology in South Africa. He is a past President of the South African Association of Botanists and current Vice-Chair of the International Society of Sugarcane Technologists. Served as board member of PlantBio, National Innovation Centre for Plant Biotechnology, and member of the GMO evaluation Committee, Department of Agriculture, Forestry and Fisheries in South Africa. His research focus is on the genetic and molecular control of carbon partitioning in the culm and leaves of the C4 grasses with special attention to sugarcane. He has authored 190 scientific papers, 4 book chapters and a book on Sugarcane Physiology. Co-inventor on 4 registered international patents.

Biljana Nikolic*[1], Vele Tesevic[2], Ljubinko Rakonjac[3] and Petar D. Marin[4]

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Biochemistry of some relic and endemic conifers of Balkan Peninsula

Three high-mountain tree species from the Pinaceae family were investigated: Serbian spruce, *Picea omorika* (Panč.) Pürkyne, Bosnian pine, *Pinus heldreichii* Christ., and Macedonian pine, *Pinus peuce* Griseb. Although they belong to different subfamilies (Abietoideae and Pinoideae), genera (*Picea* and *Pinus*), subgenera (*Pinus* and *Strobus*), and have clear morphological differences, all three species, which are autochthonous in Serbia and Balkan Peninsula, have several common features: endemic-relic character, disjunctive area of distribution, higher or lower vulnerability (IUCN Red lists), under-investigated variability as well as taxonomic, phylogenetic, and conservation statuses. Since Serbian spruce, Bosnian and Macedonian pine, as well as some other relict gymnosperms from Balkans, are important links for the understanding of the phylogenetic relations between the fossil and contemporary species belonging to the genera *Picea, Pinus*, and other conifer trees, study of their variability is of special significance for the understanding of the biogeography, taxonomy, phylogeny, and evolution of plant species.

P. omorika exhibited the highest abundance in O-containing mono- and sesquiterpenes, but a lower abundance in hydrocarbons, especially in sesquiterpenes. *P. heldreichii* showed the highest abundance of sesquiterpene hydrocarbons and the lowest for O-containing monoterpenes. *P. peuce* contained the highest amounts of monoterpene hydrocarbons and significant amounts of O-containing monoterpenes. The range of *n*-alkanes was wider in *P. omorika* (C_{18}–C_{35}) than in *P. heldreichii* and *P. peuce* (C_{18}–C_{33}). The dominant *n*-alkanes were C_{29} in the needle waxes of *P. omorika*, C23, C27, and C25 in those of *P. heldreichii*, and C_{29}, C_{25}, C_{27}, and C_{23} in those of *P. peuce*. The waxes of *P. omorika* contained higher amounts of *n*-alkanes C_{29}, C_{31}, and C_{33} , while those of *P. heldreichii* and *P. peuce* had higher contents of n-alkanes C_{21}, C_{22}, C_{23}, C_{24}, and C_{26}.

It is well known that Picea and Pinus are treated as separate genera on the basis of several, mainly morphological characters. However, in spite the fact that inter- and intrapopulation variability in the terpene and *n*-alkane composition of the needle waxes has been shown, a very clear separation of these genera was demonstrated. Thus, it can be concluded that these characters (terpenes and *n*-alkanes,) are also of great importance in the overall consideration of phytogeographic, evolutionary, chemotaxonomic, and phylogenetic aspects of these interesting conifer taxa.

Audience Take Away:

- The audience could learn chemical design of listed species and their populations
- It will help anyone who deals with phytogeography, evolution, chemotaxonomy and/or phylogeny
- It will help anyone who deals with relations between the fossil and contemporary species

Biography:

Dr. Nikolic studied Faculty of Forestry at the Belgrade University, Serbia and graduated as MS in 1989. She then joined the research group of Prof. P.D.Marin at the Institute of Botanic and Botanical Garden "Jevremovac", Faculty of Biology, University of Belgrade, Belgrade. She received her PhD degree in 2008 at the same institution. Working on the Institute of Forestry from 1990 to nowdays, she obtained the position of a Prinicipal Research Fellow. She has published more than 40 research articles in SCI journals.

V. P. S. Arora
Professor Emeritus, School of Business Studies, Sharda University, Greater Noida, Uttar Pradesh, India

Status, Issues, Prospect, and Challenges of Agribusiness in India

Global agriculture is experiencing phenomenal changes due to technological revolution, digital revolution, sprawling urbanization, accelerating growth in middle income groups, fast changing food habits and preferences, the market oscillations, and above all due to climate change and environmental degradation. These changes offer unique challenges and opportunities to transform agriculture to be more productive, economically remunerative, socially equitable and inclusive, and environmentally sustainable.

In India, during last 50 years or so, with the ushering in of the green revolution for grains in mid-1960s, followed by white revolution in milk, yellow in oilseeds, and blue revolution in aquaculture, and rainbow revolution in horticulture sector, overall agricultural and food grain production increased over four fold, several major commodities recorded 4 to 10 fold increases, food grains reaching over 290 MT, horticultural production over 315 MT, and fish production about 12 MT. India thus globally ranked among the top two producers of several major commodities, rendering the country as the second largest agrarian economy in the world.

These developments transformed the country from Ship- to- Mouth status to the status of Right to Food Bill situation; major agricultural/ food exporter; reducing the poverty and hunger levels by 50-70 per cent. Despite the excellent progress, nearly one fourth of world's hungry and 35-40 per cent undernourished and stunted children have their homes in India.

Another unique feature of India' agrarian economy is that the country is home to over one-third small and marginal farm holders, with unabating and splitting, the average holding size has reached below one hectare. And these small and marginal farmers, paradoxically comprise vast majority of the country's hungry and poor who constitute one-fourth of the world's such deprived people.

Along with technological revolutions in agriculture, farm sector in India experienced high level of commercialization of farm sector. Starting from input manufacturing and supply and production sub-sectors of farm economy, commercialization of high order has entered in marketing and trade, processing and distribution besides exports. Growth in food retailing and e-business in Indian farm sector is unpreceded. Business orientation of agriculture consulting and extension is explicitly evident.

Entrepreneurship development based in agriculture is growing very fast. Digital revolution has also taken deep roots in agriculture. Whereas the share of agriculture in national GDP is consistently declining, the share of agribusiness is consistently growing. It is worth saying that during ongoing pandemic caused by COVID- 19 it is only the agriculture sector of the economy that continued to show positive and impressive growth. Agricultural exports during this period also grew and has been responsible in narrowing down of trade gap.

Increasing agricultural productivity of the small holder farmers, poverty reduction, class and regional equity, and smashing of the epigenetic fixation of undernutrition; however, continue to bother planners and policy makers and thus must be central to the growth,

Audience Take Away:

- Historical growth in Indian agricultural and agribusiness sector and contributors thereto
- Current status of Indian agriculture and agribusiness and policy backup
- Current issues and challenges of agribusiness sector in India
- Prospect of Indian Agribusiness sector

Biography:

Dr. V P S Arora completed B. Sc. (Hons) Ag & A.H.; M.Sc. (Ag. Economics); and Ph D (Ag. Economics) from G B Pant University of Ag & Technology, Pantnagar, India. Having served Pantnagar University from 1976 to 2009 he joined Kumaun University Nainital as Vice Chancellor. He was the founder Dean of College of Agribusiness Management, Pantnagar, the first Agribusiness College in India. He has been consultant to OECD (France), APO (Japan), IRRI (Philippines), FAO (Roam) on Agricultural Policy / Agribusiness. He completed over a dozen research projects and published over one hundred research papers.

Benigno Villalon

Professor Emeritus, Plant Pathologist, Virologist, Geneticist, Plant Breeder, Texas A & M University, Texas Agricultural Experiment Station, P.O. Box 104, Weslaco, Texas, 78599-0104, U.S.A.

The science of nutritional foods for health and other wellness information about Obesity and Diabetes

The USA wastes over $3.5 trillion trying to keep its sick citizens from dying, but they still die too soon. The obesity and diabetes rates in our country have reached tsunamic proportions. A weak immune system results in many human diseases (heart, hypertension, high blood sugar, obesity, diabetes, pancreas, liver, kidney failures, dementia and cancers). The metabolic syndrome can be the result of several inflammatory factors such as high triglycerides, low HDL, high number of small LDL particles (cholesterol carriers) and excess sugars, these things lead to disease. Abundant scientific evidence shows that we can maintain a healthy longevity by following simple lifestyle rules of prevention. This requires a dramatic lifestyle change including daily exercise to strengthen all organs (muscles, stimulate the brain) and reduce the metabolic syndrome by at least 80 % (Katz).

Food is the most important medicine in the world. Conversely, food is the most important poison in the world. Two main sources of food are animals and plants. Animal food (grass fed non-processed meats) provides good proteins, saturated fats, essential minerals and vitamins (not found in plants), and some carbohydrates. Good scientific evidence proves adequate cholesterol and animal saturated fats do not cause cardiovascular diseases (Kresser). Fresh unprocessed plant food provides good proteins, mono and polyunsaturated vegetable fats (i.e., avocados, nuts, olive and coconut oils, etc.), also essential vitamins, minerals, antioxidants, and mainly low glycemic index carbohydrates and high fiber. Good fresh vegetables include peppers, tomatoes, onions, garlic, legumes, all greens, include kale, spinach, (dressing = olive oil & apple cider vinegar), spices, etc. Both food sources provide enough essential nutrients and powerful heart healthy antioxidants. Science indicates 80% of vegans might have nutritional deficiencies in certain vitamins, minerals, etc. found only in animal foods. Beware of artificial supplements. One should limit to no consumption of processed polyunsaturated vegetables oils (trans fatty acids) as they may increase triglycerides, and omeg-6 fatty acids. These saturated fats (oils) include canola seed; corn seed; cottonseed; safflower seed; soybean seed; and sunflower seed. These oils (trans fatty acids) may be toxic (Mercola). Food is digested down to three main macromolecules: proteins, lipids, and carbohydrates. A perfectly balanced meal must contain the right proportions of these macromolecules in groups. A group collectively could be 9g protein, 7g fat, 1.5g carbohydrates for every meal. The average number of groups may be three to four per meal. No two human lifestyles are alike.

All foods contain carbohydrates. There are some 250 different kinds of sugars. There is no such thing as sugarless or sugar free foods. Excess sugars turn into fat and negatively impacts all body organs, leading to fatty liver, cirrhosis, and cancers. Sugars force the pancreas to produce insulin, insulin in right amounts is required for glucose cell absorption, for body energy, excess glucose leads to insulin resistance and type two diabetes (T2D). T2D is manmade and might be completely reversed without drugs and by reducing sugar intake. Conversely, glucose in proper proportion is the most important energy source for a healthy body.

Type 1 diabetes (T1D) is a chronic autoimmune disorder characterized by destruction of insulin-producing pancreatic β cells (any age). You might need insulin injections daily. Autoimmune disorders produce antibodies that also attack many body organs, i.e., lupus, MS, Psoriasis, etc. Fructose goes straight to the liver, is toxic, stores fat, and leads to (fatty liver), cirrhosis

and cancers. All fruits contain fructose, fiber may slow these processes, but it still is fructose. Eliminate high fructose corn syrup (Lustig).

Cancers, may not be prevented, however, new genetic immunotherapy, CAR-T cell and other new procedures are dramatically eliminating many kinds of cancers successfully (Allison).

So, eat food, not too much, mainly fresh vegetables, grass fed non-processed meats, minimize fruits, grain products (breads, cereal, pasta, heavy starches, pastries), sodas all kinds with high glycemic index sugars, exercise daily before breakfast, and live healthily ever after.

Eat food to reduce obesity, diabetes and cancer today

Eating to reduce obesity, diabetes and cancer can be accomplished simply by adding a few of our disease fighting foods to your meals each day. Like life itself, one's diet is all about making choices. Since we all eat every day, why not choose foods that can reduce your risk of disease? Listed below are some food facts, supported by scientific research, to help you get the most cancer/diabetes fighting benefits from your diet? Some scientific trials may be inconclusive?

Eliminate excess sugars to reduce weight, obesity, CVD, diabetes and cancers, etc.

Sugar is toxic, deadly, and 10 times more addictive than cocaine and or heroin (Lustig).

Be picky. Bell peppers contain 5 times more Vitamins C and A than tomatoes and 3 times more C and A than any citrus. Red Delicious apples have many cancer fighters. Peppers, tomatoes and onions contain many cancers fighting compounds (salsa picante). Red Wine grapes and many berries contain resveratrol, a cancer fighter. Eat Your Sprouts. Broccoli sprouts can contain more cancer-fighting properties than regular broccoli. Green teas contain cancer-fighting molecules. Most vegetables can be eaten fresh. Raw tomatoes are good but slightly cooking them in olive oil releases more lycopene, the cancer fighter. Chew Your Greens. Chewing kale, spinach, leafy greens with olive oil & apple cider vinegar helps to release enzymes that activate cancer-fighting molecules embedded deep in the leaves. Go Soy, fermented soy, like the kind used in miso soup, contains four times more cancer fighters than regular soybeans.

Choose one cancer fighting food for each meal. At 3 meals each day, that adds up to more than a 1,000 of cancer fighting food choices each year.

Acknowledgements of some human disease prevention scientists

Dr. James P. Allison, Genetic Immunotherapy, Car-t cell, Cancer

Dr. Robert Atkins	High Protein, Low Carbohydrates
Dr. R. K. Bernstein	Diabetes, Blood Sugar Meters
Dr. Johanna Budwig	Essential Nutrients Cure Cancer
Dr. Aubrey de Grey	Senescence, under 60, might live 1,000 years
Dr. William H. Hay	Food Combining – 1911
Dr. David L. Katz	Yale University Director Prevention Research Center
MS. Chris Kresser	Paleo Nutrition, Functional & Integrative Medicine
Dr. Robert H. Lustig	Excess sugar is addictive & fattening, Fructose goes straight to liver damage
Dr. J.P. Mercola	Saturated fats & cholesterol are our friends
Dr. Weston A. Price	Price Foundation-1930's, Saturated Fat, Nutrition & Physical Degeneration
Dr. Berry Sears	Zone Diet

There are thousands of other internationally renowned Research Medical Doctors and Scientists dedicated to the prevention of human disease through proper nutritional foods for health.

Our government and the entire medical profession should emphasis human disease prevention.

Disclaimer: Any medical related information presented in this health/nutrition seminar is at best of a general nature and cannot be substituted for the advice of a medical professional, i.e., qualified doctor/physician, nurse, pharmacist/chemist, etc. None of the individual contributors nor anyone else connected to these presentations can take any responsibility for the results or consequences of any attempt to use or adopt any information presented. Nothing should be construed as an attempt to offer or render a medical opinion or otherwise engage in the practice of medicine.

Biography:

Dr. Nikolić studied Faculty of Forestry at the Belgrade University, Serbia and graduated as MS in 1989. She then joined the research group of Prof. P.D.Marin at the Institute of Botanic and Botanical Garden "Jevremovac", Faculty of Biology, University of Belgrade, Belgrade. She received her PhD degree in 2008 at the same institution. Working on the Institute of Forestry from 1990 to nowdays, she obtained the position of a Prinicipal Research Fellow. She has published more than 40 research articles in SCI journals.

Dachang Zhang
Water & Eco Crisis Foundation, San Jose, California, USA

Suitology— A new water science to meet the challenges of climate change and agricultural sustainable development

Extreme climate change with increasing frequency and magnitude has globally caused great damage and loss through extreme droughts, floods and other secondary disasters during the past years. The most affected are agriculture and ecology. Floods and secondary disasters such as soil loss, mudslides, and landslides often cause losses to farmland, houses, and life. Extreme droughts cause water shortages for humans and livestock, crop failure, forests withered, and desertification. Facing disasters, traditional measures for flood or drought often fail. Traditional water science regards the surface and underground water produced by precipitation as the total

amount of water resources. However, in the current situation, floods are actually just the source of disasters rather than water resources. In the extreme drought period, the so-called "water resources" has lost its meaning. Obviously, the traditional concept of water resources is very flawed and cannot effectively guide water management.

In order to meet the challenges of climate change and sustainable agricultural development, we have proposed Suitology (from Chinese and Japanese: shuitai/suitai, "water dynamic status"; and from Greek: λόγος, logos, "study of") as a new branch of water science to redefine water resources and guide the optimization of water management accordingly. Suitology reveals that water resources are different from other resources from a dynamic point of view. Only the used part can become a resource, and the unused part will be lost and cannot become a resource. Therefore, water resources have the characteristics of being created.

Suitology focuses on how to lead water as a resource and conform to the system situation of economic, social and ecological carrying capacity and sustainable development as the core, regards water management and its service objects, environment and conditions as a dynamic system that restricts and promotes each other, studies the natural situation of water, the impact of human intervention on the

water situation, the negative and positive situation transformation relationship between the disasters nature and resources nature of water, and the relationship among water situation changes and economic, social and ecological systems, takes sustainable development as its basic ideological principles, and applies the concepts, knowledge

and research methods from systems theory, cybernetics, information theory, operations research, and circular economy to research, and guides the integration and optimization of the existing flood control systems, drought control systems, and irrigation systems to a new type of low-cost, low-energy consumption, low-carbon footprint, easy-to-build and -handle water management system with significant comprehensive benefits. The study of Suitology will enhance the development and utilization of water resources, accelerate the progress of combating the disasters of drought and flood and desertification, and support sustainable ecological environment, economic growth, social development and poverty eradication.

Audience Take Away:

- A new understanding and definition of "water resources" which is dynamic and has characteristics of being created, from

dynamic and systematic point of view

- A new water resources science, through studies of water dynamic status, an indepth research of systematic strategic operations to combat floods and droughts and create water resources
- A systematic concept combining climate change adaptation, disasters-mitigation of floods and droughts and other secondary disasters, and sustainable agricultural and eco- development, through turning floods into water resources, as a win-win-win proposal
- Promoting cooperation among all levels of government, communities, nongovernmental organizations and landholder

Biography:

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

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SPEAKERS DAY 1

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SEP 30-OCT 01, 2021

AGRI 2021

Karine Chenu
The University of Queensland, the Queensland Alliance for Agriculture and Food Innovation (QAAFI), Toowoomba, QLD 4350, Australia

Genotype and Management adaptation of crops to current and future climates

With climate change, increase in CO2 concentration, temperature, evaporative demand and rainfall variability are projected to impact different crop processes and their interactions. Here, a modelling approach was used to characterise the type of abiotic stresses that wheat crops are currently and will experience in projected climate scenarios across the Australian wheatbelt. Genotype and management adaptations are first proposed in terms of crop maturity type and sowing date to best tune crop development with environmental variability.

An integrated approach is also proposed to guide breeding and adapt wheat varieties. The approach combines insights from crop modelling, physiology, genetics, and breeding to characterize traits valuable for yield gain in the target population of environments, develop relevant high-throughput phenotyping platforms, and identify genetic controls and their value in production environments. This part of the presentation will use transpiration efficiency (biomass produced per unit of water used) as an example of a complex trait of interest to illustrate how the approach can guide modelling, phenotyping, and selection in a breeding programme.

By integrating insights from diverse disciplines, the proposed approach can increase the efficiency for improving yield gains in target populations of environments in current and future climates.

Audience Take Away:

- Look at the problem from a broad angle
- Think in an integrative manner
- Integrate disciplines to solve complex problems currently faced by agriculture
- Characterize the nature and frequency of abiotic stress in target environments
- Look for both agronomic and breeding solutions

Biography

Dr Karine Chenu is a senior ecophysiologist and crop modeller at the University of Queensland. She leads a group that works on crop modelling, plant design and breeding strategies in winter cereals. Karine's research mainly concerns understanding trait physiology and genetics, developing gene-to-phenotype crop modelling and exploring novel combinations of genotypes, environments and management practices to assist productivity improvement in changing environments. Karine has published over 100 research publications, including some breakthrough papers on crop modelling, plant response to heat and drought, and genetics.

Ayumi Deguchi*[1], Fumi Tatsuzawa[2], Kotaro Ishii[3], Tomoko Abe[3], and Kazumitsu Miyoshi[1]

[1]Graduate School of Horticulture, Chiba University, Matsudo, Chiba, Japan
[2]Faculty of Agriculture, Iwate University, Morioka, Iwate, Japan
[3]Nishina Center for Accelerator-Based Science, RIKEN, Wako, Saitama, Japan

Localized repression of two bHLH genes are involved in white margins in flowers of carnation by the absence of synthesis of anthocyanins

Flower colour patterns are attractive traits for floricultural plants. However, the mechanisms of such traits remain mostly unknown and obscure. Carnation (*Dianthus caryophyllus* L.) and its interspecific hybrids have many flower colour patterns, which involve white margins in reddish petals, represented by the cultivar 'Minerva'. We studied the factors regulating the formation of white marginal flowers in given cultivars by the pigments and the related gene expression. HPLC analysis revealed the absence of anthocyanins in white margins, although the accumulation of other flavonoid pigments, namely flavonols, was almost identical between the central and marginal regions of petals. As the result of RNA-seq between the dark-red central regions and the white marginal ones of petals in 'Minerva', the expression of 18 genes related to biosynthesis and transportation of anthocyanins, including some transcription factors, were found to be different. Further analysis of the expression of these genes by real-time RT-PCR by comparison with two white-marginal-flowered cultivars and three red-unicolour-flowered ones indicated that the expressions of two bHLH transcription factor genes and seven structural genes, such as *dehydroflavonol 4-reductase, anthocyanidin synthase,* and *glutathione S-transferase*, were positively correlated with anthocyanin accumulation. Although *DcbHLH1*, which was a homolog of *JAF13* in *Petunia xhybrida*, was expressed in both the flower colour groups, *DcbHLH2*, a homolog of *AN1*, was expressed only in white-marginal-flowered cultivars. Both bHLH genes may have a partially redundant function for the regulation of anthocyanin synthesis. Therefore, it can be considered that the localized repression of both bHLH genes was involved in the formation of white marginal flowers in carnation through the induction of the absence of anthocyanin accumulation in the marginal region of petals. Particularly, *DcbHLH2* could act as a key gene because of its restricted expression only in cultivars with white marginal flowers.

Biography

Dr. Deguchi studied Agriculture and Horticulture Science at Kyoto University, Japan, and graduated in 2011. She then proceeded to the Graduate School of Agriculture, Kyoto University and received her Ph.D. degree in research on the flower colour of dahlia (*Dahlia variabilis* L.) in the year 2016. After 1-year postdoctoral fellowship at the Laboratory of Information Biology, Ryukoku University, she obtained the present position of an Assistant Professor at the Laboratory of Ornamental Horticulture Science, Chiba University.

Ran Tong, Benzhi Zhou*, Xiaogai Ge, Yonghui Cao
Research Institute of Subtropical Forestry, Chinese Academy of Forestry,
Hangzhou, China

Soil carbon, nitrogen and phosphorus stoichiometry and its influencing factors in Chinese fir plantations across subtropical China

The soil carbon (C), nitrogen (N) and phosphorus (P) stoichiometry are key indicators of soil interior nutrient cycling and plant nutrient supply that play important roles in improving our understanding of biogeochemical cycling, and providing valuable information for forest management. To date, lots of related information was obtained from local scales, while little were focused on regional or larger scales, especially for a single plantation tree species. In this study, surface soil samples (0-20 cm) of Chinese fir (*Cunninghia lanceolata* (Lamb.) Hook) plantations across subtropical China were collected, and the C, N and P contents were measured. Results showed that the range of C:N, C:P, and N:P ratios were 7.32-18.27, 20.15-230.48, and 2.11-15.05, with mean value of 13.22, 83.50, and 6.05, respectively. Well-constrained correlations were found for SOC and TN, as well as TN and TP. Soil TN and TP contents increased with increased altitude, whereas soil C:N, C:P and N:P ratios decreased. Soil TP content decreased, and C:P ratio increased with increased mean annual temperature (MAT) and annual total solar radiation (ATSR). Soil C:N, C:P and N:P ratios increased with increased mean annual precipitation (MAP) and annual evaporation (AE). Our findings suggest that soil nutrients were in the state of relatively adequate supply and healthy nutrient cycling. Altitude and water indicators (MAP and AE) were the major geographical and climatic variables influencing soil stoichiometry, respectively. Overall, the results could shed light on the nutrient cycling in soil and the effects of climate changes on soil to provide valuable information for plantation management.

Biography

Dr. Benzhi zhou studied Forest Ecology at Chinese Academy of Forestry (CAF) and graduated as MS in 1996. He then worked in the Research Institute of Subtropical Forestry, CAF. He received his PhD degree in 2006 at the same institution. He has published more than 100 research articles and about 20 among them were indexed in SCI(E).

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Extraction and identification of bioactive compounds from organic White Mugwort (*Artemisia lactiflora* Wall.)

White mugwort (*Artemisia lactiflora* Wall.) is an edible medicinal plant from traditional Chinese medicine which has been subjected of considerable attention due to their remarkable biological activities such as antitumor and antioxidant activity. In Thailand, the aerial part of this plant is commonly consumed to treat and prevent diseases, especially cancer. Although there is no clear scientific evidence on its anticancer and other biological activities, this plant provides innumerable health benefits due to the containing phytochemicals. To date, there are limited research investigating on the phytochemical constituents and bioactivity of this plant. Therefore, the aim of this study was to identify the polyphenol compounds in organic white mugwort and investigate on biological activities of its extracts. In the present study, three main phenolic compounds i.e., gallic acid, isoquercetin and quercetin, were identified in fresh aerial part extract (FE) and dried powder extract (PE) from white mugwort obtained by HPLC-DAD. Pro-inflammatory genes were down-regulated in LPS-stimulated THP-1 treated with PE indicating anti-inflammatory activity. FE and PE decreased lipid accumulation of 3T3-L1. FE showed a stronger cytotoxicity on 4 cholangiocarcinoma cell lines (KKU-M213, HuCCA-1, RMCCA-1, and KKU-M055) than those of PE. As a result, white mugwort is a prominent source of natural antioxidants exhibiting underline health benefits.

Audience Take Away:

- Phytochemicals containing in white mugwort
- Natural antioxidative agent
- Natural anti-inflammatory agent
- Natural anti-adipogenic agent
- Natural anticancer agent

Biography

Ms. Nacha Udomwasinakun completed her bachelor's degree in Agro-Industrial Product Development from Kasetsart University in 2016. She received the Ph.D.-RRI research fund from Thailand research fund and is currently a Ph.D. candidate in Ph.D. program in the same major. Her research is focused on development of functional product from natural ingredients including evaluation of their related bioactivities.

Niranjana M*, Sekhon NK, Chetna Chugh, Jha SK, Niharika Mallick, Anupama Singh, Prachi Yadav, Sharma JB, Tomar SMS, Vinod

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Exploring novel leaf rust resistance genes in *Aegilops speltoides* and *Ae. variabilis* for imparting leaf rust resistance in bread wheat (*Triticum aestivum* L.)

Wheat (*Triticum aestivum* L.) is one of the three major cereal crops covering an area of 218 million hectares (mha) area globally producing a total of 771million tonnes (mt) of grains. Biotic stresses are major limiting factors affecting wheat crop from realizing its yield potential. One of the major biotic stresses affecting wheat cultivation globally is brown/leaf rust caused by *Puccinia triticina* Eriks. Utilization of genetic resistance is the best way to mitigate leaf rust infection. *Aegilops* species are wonderful germplasm resources that have significantly contributed to wheat breeding as source of resistance genes especially against wheat rusts. *Ae. speltoides* (SS) belongs to Sitopsis and *Ae. variabilis* (UUSS) belongs to *Aegilops* section of the genus *Aegilops. Ae. speltoides* is the donor for several leaf rust resistance genes *Lr28, Lr35, Lr36, Lr47* and *Lr51*, while *Lr59* was derived from *Ae. variabilis*. We have identified 133 leaf rust resistant *Ae. variabilis* derived introgression lines and 43 leaf rust resistant *Ae. speltoides* derived introgression lines against the most predominant virulent race in India 77-5 (121R63-1= THTTS). Multi-pathotype testing using 22 leaf rust races was undertaken in selected resistant lines viz., four *Ae. speltoides* derived introgression lines Sel.2427, ET, ASD546-4, ASD753 and two Ae. variabilis derived introgression lines AVD243-4, AVD836. Ten-day-old seedlings were inoculated by spraying a solution of uredospores and incubated for 48 hrs in a humid chamber which were shifted to greenhouse benches under ambient temperature, light and relative humidity conditions. Individual seedlings were scored for leaf rust reaction at 12 days after inoculation. Sel.2427, ET, ASD546-4 and AVD243-4 were found resistant to all the races. While AVD836 showed resistance to all races except 77-8 (253R31=TGTTQ) which is typical of *Lr19* gene. Another *Ae. speltoides* derived line ASD753 showed resistance to all races except 77-10 (377R60-1= MHTTS) which is typical of Lr28 gene. Molecular markers linked to *Lr19, Lr28, Lr24* and *Lr34* were utilized for confirming the uniqueness and novelty of resistance in all the resistant lines. Selection2427, ET and AVD243-4 which were found to be resistant to all races were also found to be unique from *Lr24*, the leaf rust resistance gene having no known virulent race in India. In Selection2427, a dominant *Lr* gene was mapped to the long arm of 3B chromosome. However, presence of gametocidal genes affects utilization of this gene in wheat improvement. Mutagenesis by gamma ray irradiation was exploited to break the association of leaf rust and gametocidal genes and leaf rust resistant mutants with good fertility and seed set have been developed. Genomic dot-blot hybridization was utilized for detection of alien genomes in the introgression lines. Novel leaf rust resistance genes were identified in 88 *Ae. variabilis* and two *Ae. speltoide*s derived lines. These genes will be an asset in wheat resistance breeding. Wild relatives of wheat are a wonderful source of rust resistance genes. Utilization of these germplasm resources will help broaden the genetic variability available in wheat and prevent genetic erosion.

Audience Take Away:

- Importance of wild germplasm resources in broadening the genetic base in crops especially wheat.
- Advantages of genetic resistance over chemical methods of disease control.
- Sources of genetic disease resistance to combat wheat rusts.
- Utilization of novel disease resistance genes in wheat improvement.

Biography

Dr. Niranjana M studied Agriculture for graduation and specialized in Genetics & Plant Breeding for Post-graduation. She received her PhD degree in 2016 from ICAR-Indian Agricultural Research Institute (ICAR-IARI), New Delhi, India and joined Agricultural Research Service (ARS) in the same year and same institution. She has been working in wheat pre-breeding for 7 years starting from her doctoral research and has her expertise in wheat genetics, cytogenetics and plant breeding. Her research focuses on identification, cytogenetic and molecular mapping of disease resistance genes from under-utilized wild germplasm of wheat.

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Alternate wetting and drying: A promising water saving approach to reduce methane emission without lessening yield in dry season rice

Despite enhance nitrous oxide (N2O) emission, alternate wetting and drying (AWD) irrigation reduces water input and CH4 emission over continuous flooded (CF) field with no significant yield reduction. Emission of these gases may further be impacted by broadcast prilled urea (PU) or deep place urea briquette (UB) either at their equal or differential N rates which should be evaluated for Bangladeshi paddy fields. To assess CH_4 and N_2O emissions, N fertilizers use efficiencies and grain yield, we set up an experiment at the paddy field managed by Soil Science Division of Bangladesh Rice Research Institute (BRRI) from January to April, 2020. The cultivated rice variety (BRRI dhan81) was grown under CF and AWD irrigations, with (broadcasted PU N: $PUN_{120/78}$ or deep placed UB N: UBN78) or without N fertilizer application (N0). Gas samples were collected regularly by closed chamber and analyzed by GC, to compare CH_4 and N_2O emissions. To record grain yield 125 hills plot-1 (~ $5m^2$) was harvested. Grain yield in all N fertilized plots were significantly ($p<0.01$) greater than that in N unfertilized plots (N0). However, water management and its interaction with N fertilizer treatments had no significant effects on grain yield ($p = 0.756$ and $p = 0.112$, resp.). The recovery (REN: 17-54%), physiological (PEN: 30-45 kg grain kg-1 N uptake) and agronomic (AE_N: 13-25 kg grain kg^{-1} N applied) efficiencies were in line with previous studies. In each irrigation management, the recovery (RE_N), physiological (PE_N) and agronomic (AE_N) efficiencies at UBN_{78} were closer to that in PUN_{120}. Irrespective of N fertilizer treatment, overall CH_4 emission fluxes were greater in all CF plots than that in AWD particularly from 36 to 70 DAT. Cumulative seasonal CH_4 emission were significantly lower in AWD than CF ($p<0.01$) but did not statistically differ between N fertilized and unfertilized treatments ($p = 0.118$). Also the interaction effects of N fertilizer and water management on seasonal CH4 emissions were insignificant ($p = 0.439$). Seasonal CH_4 emission was decreased by 70 (in AWD-UBN_{78}), 86 (in AWD-PUN_{120}), 102 (in AWD-PUN_{78}) and 177 (in AWD-N0) kg CH_4 ha^{-1} resp., over corresponding treatments under CF which equals 20-41% reduction in CH4 emission under AWD. The yield scale seasonal CH_4 emission (in kg CH4 ha^{-1} t^{-1} grain yield) ranged from 48-72 in AWD and 65-130 in CF with its lower values in PUN_{120}-AWD (48) and UBN_{78}-AWD (56), and higher values in PUN120-CF (65) and UBN_{78}-CF (73). So, UBN_{78}-AWD seemed almost equally capable to reduce seasonal CH_4 emission and provided comparable N fertilizer use efficiencies with that in PUN_{120}-AWD, but requires further verification in more paddy fields.

Biography

Dr. Masuda joined at Soil Science Division of Bangladesh Rice Research Institute (BRRI) as Scientific Officer in 2007 and promoted to Senior Scientific Officer in 2012 with continuing work here till now. She received her MSc in 2013 from Ghent University, Belgium. She joined the research group of Soil Fertility and Nutrient Management at Department of Soil Management of Ghent University, Belgium and received her PhD in 2018. She works with paddy soil organic matter decomposition, N mineralization, greenhouse gas emission, pore water chemistry and microbial activity. She is the author of 14 articles published at national and international journals.

Hana Auer Malinska*[1], Martin Vanek[1], Diana Nebeska[2] and Josef Trogl[2]

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Physiology changes induced by priming in *Miscanthus x giganteus*

During last couple of years, traditionally mild climate of central Europe displays more and more extremes in temperature and amount of rainfalls. Springs changed to very hot and dry, with severe temperature changes within couple of days. Local plants and crops need to deal with this stressful situation causing yield decrease. Our major aim was to explore simple ways of „hardening" to help *Miscanthus x giganteus* deal with climate changes more easily and improve its productivity as biomass crop in the same time. Plant priming has been discussed as cheap and simple tool to improvement of plant qualities. Certain doses of vitamins, metals as priming compounds, as well as different initial cultivation conditions (cold, hot, dark, ...) were applied to study changes in plant physiology using non-invasive methods of measurement of leaf fluorescence and reflectance. After short priming period, all plants studied were cultivated in greenhouse under conditions mimicking latest trend of climate.

We used 4 physical treatments (hot, cold, dry, dark) and 4 chemical treatments (copper, nitrogen, vitamin B and vitamin C) and non-treated plants as control. All treatments had big influence on photosynthetic processes and also influenced production of photosynthetic pigments. Our results show that application of certain physical and chemical primers to young *Miscanthus x giganteus* can result in substantial physiological changes, mainly in respect to effectivity of photosynthesis and change in cell wall composition. Altered synthesis of cell wall components is one of possible ways, how the plant can cope with stress-by reinforcement of cell wall. Increased synthesis of lignin accompanied several priming treatments hand in hand with prolonged vegetation season and increased biomass production.

Audience Take Away:

- Plant priming is simple way of hardening plants
- It is cheap and its effect is long-term (lasts more than one year in perennials)
- It could be massively used in agriculture to decrease yield loss caused by abiotic stressors
- Priming method has to be chosen carefully according to our goal, because different concentrations of priming chemical can have opposite effect

Biography

Currently working as junior researcher and teacher at the University of Jan Evangelista Purkyne in Usti nad Labem, Czech Republic. Topics of interest: Plant physiology, Molecular biology, Plant biotechnology.

Formerly Ph.D. student in Czech Academy of Sciences, Institute of Biophysics, Brno, Czech Republic. Author of several papers about plant polyploidy, plant physiology and abiotic stress.

Pimentel, Carlos
Department of Crop Science, Federal Rural University of Rio de Janeiro, Rio de Janeiro, RJ, Brazil

GHG production and effects on tropical agriculture: The case of Brazil

The activity of atmospheric gases, especially greenhouse gases (GHG), as water vapor, carbonic gas, methane, nitrogen oxides, and ozone, became an object of study because of its increase in the atmosphere, causing a rise in air temperature, drought events, and others environmental stresses. In addition to carbonic gas, there was an increase in the emission of Volatile Organic Compounds (VOC) in the troposphere and nitrogen oxides, which generates ozone, toxic to all living beings. These phenomena occur especially during winter and spring with the increase in biomass burning in this dry season. This ozone produced at low altitudes reduces photosynthesis and yield of sensitive crops, like soybean and cotton, important Brazilian crops. Therefore, in tropical countries, the atmospheric concentration of carbonic gas, nitrogen oxides, VOCs, and thus, ozone too are increased by biomass burning during the dry season. The prevision of a substantial increase in the atmospheric concentration of carbonic gas during the next years will cause increase in photosynthesis and biomass of C3 plants, especially in woody and grasses species, in detriment to C4 plants. However, this increase can be lower than predicted by studies carried under controlled conditions, as demonstrated by field results. It is more reduced by ozone produced simultaneously in the dry season, just before the most crucial cultivation of the year, at the rainy season. The large concentration of these GHG in the atmosphere will raise the air temperature and alters precipitation, and reduce the soil water content causing water stresses, which can annul the fertilization effect of carbonic gas, potentially extending the harmful impact of the ozone increase in the biosphere. However, these studies have been conducted in temperate regions, and little is known about the effects of carbonic gas and ozone on the metabolism of crop cultivars in tropical countries. In industrialized countries, the increase in ozone and carbonic gas is mainly due to fossil fuel burning, especially during summer. In tropical countries, like Brazil, the production of these gases occurs in the dry season (winter and spring), in the savannahs, the Cerrado ecosystem in Brazil, where the Brazilian agriculture is principally made. The GHG production is due to natural or anthropogenic biomass burning, and it will affect the crops during the rainy season when the crop has the year's maximal yield potential.

Audience Take Away:

- The presentation shows the differences in GHG sources on tropical climate when compared to the temperate climate.
- The presentation shows the differences in GHG effects during the tropics year compared to a temperate climate.
- The presentation will help people working on agriculture in tropical countries to understand when the GHG affects crops.
- The presentation shows an actual increase in CO2 and O3 production in Central Brazil, which is very high, already affecting the yield of essential cultures, as soybean and cotton.
- The presentation is an alert to monitoring GHG production and its effects on Central Brazil, where most Brazilian agricultural production occurs.

Biography

Prof. Pimentel graduated in Agronomy at the Federal Rural University of Rio de Janeiro, Brazil, in 1977. He then joined the research group of Prof. Vieira da Silva at the University of Paris 7 (Jussieu), Paris, France. He received his Ph.D. degree in 1985 at the same institution. In 1988, he was approved in a Concours of Associate Professor at the Federal Rural University of Rio de Janeiro. In 1994, he passed another Concours and obtained the position of Full Professor at the same University. He did one year of sabbatical leave (1999-2000) supervised by Dr. Long at the University of Illinois, U.S., working on the FACE programs with the GHG effects on soybean and corn. He has published more than 60 research articles in SCI(E) journals, with more than 2500 citations in Web of Science, two books for graduated programs on agriculture in Brazil, and created two new varieties of pearl millet for agriculture.

Nisreen A. AL-Quraan*[1], Zakaria I. Al-Ajlouni[2], Ziad Jaber[1]

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Environmental and geographical impacts on ruta graveolens plants metabolism

Ruta graveolens is part of the Ruta family, widely known as the common Rue. It is a medicinal and culinary plant, commonly grown as an ornamental plant as well as medicinal herb. It is native to the Balkan Peninsula but is now grown in gardens throughout the world. Jarash and Ajloun are two different geographical and environmental areas in northern Jordan. The objective of this study is to determine the optimal environment for R. graveolens cultivation based on growth and metabolic assessment. Random collection of samples of R. graveolens from areas within Jarash and Ajloun were collected. Two areas within Ajloun (Ajolun A and B) and two areas within Jarash (Jarash A and B) were chosen based on how well they represented the diversity of environmental conditions. Shoot tissues were used to determine the MDA level as an indication of ROS, chlorophyll content, GABA metabolite accumulation level, total carbohydrates and protein levels. Data showed that Ajloun A has the highest carbohydrate level, while Jarash B and Ajloun B exhibit slightly elevated levels of MDA in comparison with the remaining two areas. Jarash B containing the lowest concentrations of proteins which explained by the direct sunlight and ample rainfall it receives. Ajloun B contains higher amounts of protein despite similar rainfall due to its blotched sunlight. High GABA level were detected in Ajloun B in comparison to all three remaining areas. Chlorophyll concentration were significantly varied between the four locations with higher level of chlorophyll a in Jarash areas compared to Ajloun areas. Data indicated that different environmental condition alters the Ruta graveolens metabolic stabilization in term of C:N balance related to protein, carbohydrates and GABA shunt metabolic pathways.

Audience Take Away:

- Data showed that Ajloun A has the highest carbohydrate level, while Jarash B and Ajloun B exhibit slightly elevated levels of MDA in comparison with the remaining two areas
- Jarash B containing the lowest concentrations of proteins which explained by the direct sunlight and ample rainfall it receives
- Ajloun B contains higher amounts of protein despite similar rainfall due to its blotched sunlight
- High GABA level were detected in Ajloun B in comparison to all three remaining areas
- Chlorophyll concentration were significantly varied between the four locations with higher level of chlorophyll a in Jarash areas compared to Ajloun areas.
- Data indicated that different environmental condition alters the Ruta graveolens metabolic stabilization in term of C:N balance related to protein, carbohydrates and GABA shunt metabolic pathways.

Biography

Nisreen AL-Quraan graduated in 1998 with Bachelor of Science degree from the Department of Biological Sciences, Yarmouk University, Jordan. She joined the graduate program in the Department of Biological sciences, Yarmouk University and received her Master of Science degree in Plant Biochemistry and Molecular biology in 2001. After completion of her MS, she worked as research and teaching assistant for two years in the Department of Biological Sciences, Yarmouk University, Jordan. On May, 2004 she joined the Department of Biological Sciences, Auburn University, Alabama, USA to pursue her PhD degree in Plant Biochemistry and Molecular Biology working on the plant abiotic stress interaction and the role of GABA shunt pathway in plant stress tolerance. She obtained her PhD Degree in August, 2008 from Auburn University, Alabama, USA. Since September 2008, Nisreen AL-Quraan has been working as a professor in plant biochemistry and molecular biology at Jordan University of Science and Technology, JORDAN. Her research is focusing on investigating the pathways that enable plants to adapt and tolerate harsh biotic and Abiotic stress conditions. She is interested in understanding the role of GABA shunt metabolic pathway that is activated in response to the interactions between plants and its environments. Research interest: Plant Biochemistry and Molecular Biology, Plant and Environment, Stress Physiology

Danilo Jose Fanelli Luchiari
GTACC – Grupo Técnico de Assistência e Consultoria em Citros Brazil, São Paulo, Bebedouro, Brazil

Food production x irrigation x natural resources in Brazil: Successful case and challenges for environmental sustainability

Brazil is a country with a strong vocation for agriculture, owing to its abundance of the two main inputs needed to produce plant protein, namely sun and water. Tropical weather, high solar intensity and large extent of fertile soils are the ideal conditions for producing food at a low cost. Such conditions enabled Brazil to largely increase its food production to supply the world and resulted in two distinct consequences: increased yield per unit of area and increased physical farming areas, pressuring the occupation of part of forest areas.

This study presents a synthesis of priority strategic macro-actions that should be adopted in Brazil in order to increase the production of food at a low cost, alongside the best development manner, environmental sustainability and preservation.

The basis for this study was an actual success case of introducing irrigation in citrus grown for processing, which resulted in increased yield along with high environmental sustainability. The citrus planted area has been reduced to half its extent in the last fifteen years, but the same yield was maintained thanks to the increment brought by irrigation. Since the goal for our citriculture is a two-fold yield increase in the next ten years, there is a need to considerably increase the water availability to make new irrigated areas productive and to maintain the environmental sustainability.

This study compares and prioritizes the main strategic macro-actions adopted to produce food in Brazil and is aimed at serving as an example to all other developing countries with tropical weather, enabling increased food production at a low cost and eliminating world hunger, improving the quality of life of the population and guaranteeing the preservation of the environment with high environmental sustainability.

The result of this study sets the order of importance of the priority strategic macro-actions for Brazilian agriculture to increase its food production at a low cost, by prioritizing the increase in yield per unit of area in rainfed areas, then the increment in yield brought by irrigation, and lastly the physical expansion of agriculture into forest areas, with the adoption of existing legal measures and the recommendation of improvement to guarantee the environmental preservation and sustainability, for those three scenarios.

Biography

Danilo José Fanelli Luchiari, Agronomist - UNIPINHAL (1984), with a Master's Degree in Civil Engineering – FEC/UNICAMP (1989) and Specialization in Environment - ESALQ/USP (1994). Consults for the largest irrigated citrus area in Brazil, works in Latin America. Accountable for the reintroduction of drip irrigation in Brazil. Works with fertigation of agribusiness effluents. Participates in programs to optimize river basins. Developed governmental projects for the settlement of multiple families in irrigated fruit growing regions in northern Brazil. Member of the GTACC group providing technical assistance to the largest citrus planted area in the country.

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Effect of inoculation with Acaulospora and Glomus on growth and nutrition of Blueberry plants (*Vaccinium corymbosum*) with different fertilization levels

In recent years the demand for blueberries worldwide has been growing, due to the nutraceutical properties of the fruit that generate important benefits for human health. Colombia, due to its diversity, has a great opportunity to meet the demands of the world market. In the present study, the effect of two arbuscular mycorrhizal fungi (HFMA), of the genera Glomus (Glo) and Acaulospora (Aca) associated with blueberry plants var. Biloxi when growing on three levels of fertilization (100, 50 and 0%). The results indicate that blueberry plants inoculated with HFMA (Glo) under conditions of nutritional stress (50HFM1 +) presented an increase in dry mass (DM), plant height (AP), basal branches (RB), leaf area (AF) and root / part area ratio (R / PA), with increases in chlorophyll concentration, with statistically significant higher values with respect to treatments without inoculation with nutritional stress (0HFM- and 50HFM-). The plants inoculated with (Glo) achieved an increase in AP, while those inoculated (Aca) increased in RB, when they grew under nutritional stress in relation to the control without inoculation. The results suggest that the best association of blueberry occurs with Glomus with increased growth and nutrition (N, P, K, Ca, Mg and S).

Biography

Dr. Gabriel Roveda Hoyos from the National University of Colombia, with a master's degree from the University of Wales, United Kingdom and a specialist in remote sensing applied to natural resources. Researcher and professor with 30 years of experience (CORPOICA) in the areas of agriculture, ecophysiology and microbiology and soils, with an emphasis on aspects of natural resource conservation, sustainable production and food security. I participated in the design of research, development and technological innovation proposals for Latin America, in research groups of entities such as: CORPOICA, FEDESARROLLO, public and private universities, in the integration of innovation processes with government agencies and production companies. I have worked in networks, institutional nationally and internationally with agencies such as MinColciencias, Ministry of Agriculture and Rural Development, World Bank, European Union (INCO I and II program), Procitrópicos and design of collaborative projects between countries such as Brazil, Venezuela, Peru, Guyana and Colombia. He has been a member of the International Commission on Science and Technology for Integrated Land Management, UN, Geneva and Montreux, Switzerland. I participated in forums, workshops, general policy debates and joint actions for sustainability strategies in Latin America. Co-author of publication in books / reports with around 70 scientific publications.

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A multilevel study of melon fruit reticulation provides insight into skin ligno-suberization hallmarks

The skin of fleshy fruit is typically covered by a thick cuticle. Some fruit species develop different forms of layers directly above their skin. Reticulation, for example, is a specialized suberin-based coating that ornaments some commercially important melon (Cucumis melo) fruit and is an important quality trait. Despite its importance, the structural, molecular, and biochemical features associated with reticulation are not fully understood. Here, we performed a multilevel investigation of structural attributes, chemical composition, and gene expression profiles on a set of reticulated and smooth skin melons. High-resolution microscopy, surface profiling, and histochemical staining assays show that reticulation comprises cells with heavily suberized walls accumulating large amounts of typical suberin monomers, as well as lignified cells localized underneath the specialized suberized cell layer. Reticulated skin was characterized by induced expression of biosynthetic genes acting in the core phenylpropanoid, suberin, lignin, and lignan pathways. Transcripts of genes associated with lipid polymer assembly, cell wall organization, and loosening were highly enriched in reticulated skin tissue. These signatures were exclusive to reticulated structures and absent in both the smooth surfaces observed in between reticulated regions and in the skin of smooth fruit. Our data provide important insights into the molecular and metabolic bases of reticulation and its tight association with skin ligno-suberization during melon fruit development. Moreover, these insights are likely to contribute to melon breeding programs aimed at improving postharvest qualities associated with fleshy fruit surface layers.

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KEYNOTE FORUM | DAY 2

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AGRI 2021

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Analysis of the impacts of natural disasters on food production by remote sensing taking Jiangxi, China as an example

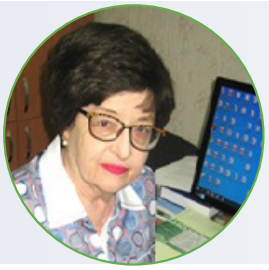
Natural disasters, typically, drought and flood, exert direct impact on crop growing performance and productivity. The objective of this research was to conduct such an impact analysis using meteorological, statistic and multi-resolution remote sensing data taking Jiangxi, China as an example. We first calculated the Standardized Precipitation Index (SPI) based on the monthly rainfall data from 83 meteorological stations of the period 1960-2020 covering the whole province to identify the drought and flood years. Then time-series MODIS vegetation data, digital elevation model (DEM) and its derived slope were employed to define the staple food, i.e., the paddy plantation area of three different cropping rice, namely, early rice (Apr-July), middle cropping rice (Jun-Sept) and late rice (Jul-Oct) by Decision-tree approaches using Landsat images and Google Earth for verification. And then, an exploration on the relationship between the vegetation indices such as NDVI, EVI and LAI and the reported rice yield (Y) was conducted to build remote sensing-based yield model. Results show that among the all the test models, those coupling the accumulated county-level average of the peak NDVI of three cropping rice of the period from 2014 to 2019 with the reported county-level annual mean rice yield are most effective for estimating the annual rice yield of each year for the whole province. The derived models are shown as follows: $y = 106489.574+0.01x+9.231E\text{-}11x^2$ (R^2= 0.894) or $y = 93087.727+0.015x$ (R^2 = 0.888), where y is the predicted county-level annual total rice yield and x the accumulated county-level peak NDVI of three cropping rice. With these models, the predicted province-level annual rice yield is in a good agreement with the government reported annual rice yield with a little difference of about 0.59-2.18%. Taking 2019 as an example, the predicted county-level annual yield is well consistent with the reported county-level annual yield, that is, $Y_p = -1889.157 + 0.966X_r$ (R2 = 0.885), where Y_p is the predicted county-level yield and X_r the reported county-level yield. As revealed by SPI analysis on the rainfall data from 1960-2020, it is noted that in the very recent five years' period, 2016 and 2017 were the normal years while 2018 was flooded and 2019 suffered from both flood and drought. In comparison with 2016 and 2017, we found that a reduction of 50,000 and 910,000 t of rice production in the province respectively in 2018 and 2019. We also noted that the government had slightly overstated the rice production by about 161,000-262,000 t in these two years. In conclusion, SPI-based analysis and time-series of remote sensing processing and modeling allow us to achieve staple crop yield prediction and analyze the impacts of natural disasters on the former.

Audience Take Away:

- The audience will learn how to analyze the drought and flood in terms of time-series rainfall data, and how to use remote sensing data to identify crop plantation and predict its production from this work
- Yes, the audience may employ the methodology in their research or teaching
- This research provide a solution for food security analysis

Biography:

Dr Weicheng Wu received his PhD in Environmental Geography from the University of Paris I-Pantheon-Sorbonne, France in 2003. After one year post-doctoral fellowship in the Ecole Pratique des Hautes Etudes in Paris, and he joined the University of Sassari in Italy as university researcher in 2005. After an international competition, he became the remote sensing specialist at the International Center for Agricultural Research in the Dry Areas (ICARDA)/CGIAR as international scientist in 2007. At last, he joined the East China University of Technology in Nanchang, China as full time professor in 2018. He has published more than 90 research papers in SCI/SCIE journals.



Pavlovskaya N.E

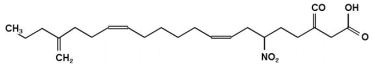
Key Lab of Digital Land and Resources and Faculty of Earth Sciences, East China University of Technology, Nanchang, Jiangxi, 330013, China

Field crops as a source of biologically active substances for crop production

The Ministry of Agriculture of the Russian Federation, the Federal State Budget Educational Institution of Higher Education "Orlov State Agricultural University, N.V. Parakhina, Department of Biotechnology. G. Eagle, Russian Federation.

Field crops: Barley *Hordéum vulgáre*, oats *Avena sativa* and buckwheat *Fagopýrum esculéntum* contain biologically active metabolites with stimulating, fungitoxicity and adaptable properties on which plant biological control tools for harmful plants are created and tested Organisms. From the roots of oates isolated avenacin, from the grain of barley gordecin, from leaves and buckwheat flowers the sum of bioflavanoids (quercetin, routine, chlorogenic acid). All of these metabolites have antioxidant properties. Avenacine is a plant antibiotic found in maximum quantities in the roots of sowing ove. The roots of the oat contain 4 groups of avenacines: A-1, A-2, B-1, B-2, the main of which is avenatein A-1 (70%). Avenacin (10-11M-10-12M) stimulates root formation and has antimicrobial action on Staphylococcus aureus, Pseudomonas aeruginosa, E.coli and fungitoxic properties against Fusarium oxysporum. The effect of avenation on the growth processes of peas has been investigated. High concentrations of avenation (10-6M) act depressingly on the development of plants in the initial stages, slowing the growth of roots. The treatment of avenaten peas in nanoconcentrations (10-10M-10-12M) has a stimulating effect on root formation. In addition, under the influence of avenationin there is a stimulation of the root formation of peas infected with Fusarium oxysporum, 2.3 - 5 times, which indicates its fungitoxic properties.

Gordecin is C25N39O7N, an in-orcitha nitrococarbonic acid. With the proposed structural formula:



Inhibition of root growth of healthy pea sprouts treated with gordecine in concentrations of 10-8-10-10 M, compared to control by 2.5 times. With the decrease in the concentration of the antibiotic, the length of gordecine-treated roots increases. Infection of Fusarium oxysporum of pea seeds and treatment with gordecin leads to an increase in root length compared to control by 2.3 to 2.7 times and recovery of plants, which is probably due to the selectivity of the action of gordeskin aimed at the pathogen.

In the leaves and flowers of buckwheat in large quantities contain routine, quercetin, chlorogenic acid, and in the roots of epicatechin, possessing antioxidants properties. From buckwheat straw, a product called RutiFlav was obtained, which is one of the components in the composition of the composition for presowing treatment of pea seeds (RF patent No. 2463759). The invention relates to agriculture and biotechnology. Using the obtained product by soaking and / or spraying pea seeds, it is possible to increase the immunity of the plant. As a result of pre-sowing treatment, the development of root rot decreases by 15%, the moth damage by 5%, while there is an increase in pea yield by 15-20%, depending on the stability of the genotype and the conditions of the year. The more stable the variety and the more favorable weather conditions for the development of plants, the less is the increase in yield when processing the drug; the less stable the variety and the worse the conditions of the year, the higher. The use of a drug in combination with chemical pesticides in field crop cultivation technologies reduces the dose of the latter by half. Buckwheat bioflavonoids have antioxidant, fungicidal and bacteriostatic properties. Thus, active metabolites isolated from plant tissues of field crops can be included in the integrated control of pests and diseases.

The presentation presents a scheme for the isolation of avenacin from the roots of oats, gordetsin from barley grain and the sum of bioflavonoids from the leaves and flowers of buckwheat. In Petri dishes with the Fusarium oxysporum seeded fungus and the disc method, the result of the fungitoxic effect of these metabolites is demonstrated. On the seeds and seedlings of peas, barley and wheat, the growth-promoting effect of metabolites is shown, data from field studies showing the effect of metabolites on the photosynthetic productivity and yield structure of a new preparation based on buckwheat bioflavonoids are presented.

Audience Take Away:

- The presentation will present specific materials on the scheme for the isolation of active metabolites from three crops and a demonstration of their fungitoxic effect on the root rot pathogen, Fusarium oxysporum, growth-promoting action on the germination energy and development of pea, barley and wheat seeds, and increasing the yield of grain and leguminous crops
- Plants, like all living organisms, strive to survive and preserve their offspring from destruction, so they developed a biological weapon with which to protect their offspring. Such compounds include antinutrients, which can be dangerous not only for insect pests or pathogens, but also for humans. These include lectins, phytates, alkaloids, etc. But there are those about which little is known, but they are no less dangerous for animal organisms (hordecin, avenacin, some phenols). It all depends on the dose and time of exposure. In small doses, you can use them to create not only medicines, but also tools that will become an alternative to chemical pesticides in the fight against harmful organisms in crop production
- Biologically active plant metabolites in the process of evolution are created by nature as a chemical weapon against other organisms and contribute to their preservation in a competition for survival. A biologist can use this property to create natural remedies as an alternative to chemical pesticides and thereby contribute to the transition of all agriculture to an organic basis

Biography:

Dr. Pavlovskaya N.E. studied biology at Tashkent University, which she graduated in 1961, worked at the Institute of Experimental Plant Biology of Uzbekistan, where she defended her dissertation in plant biochemistry in 1969, worked there as a research associate, and in 1987 she defended a doctorate at the Institute of Biochemistry named after A.V. Palladium in Kiev, NAS of Ukraine. In 1994, she moved to the Russian Federation in the city of Oryol, where she works as the head of the department of biotechnology. She prepared 32 candidates of sciences and 2 doctors. Pavlovskaya N.E. published more than 300 scientific papers, received 15 patents for plant protection products, copyright certificates for varieties of cotton, peas and barley.

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Debolina Sarkar[1,2]*, Ashley Garrill[1,2], Volker Nock[2,3]

[1]School of Biological Sciences, University of Canterbury, Christchurch 8041, New Zealand

[2]Biomolecular Interaction Centre, Department of Electrical and Computer Engineering, University of Canterbury, Christchurch 8041, New Zealand

[3]The MacDiarmid Institute for Advanced Materials and Nanotechnology, Wellington 6140, New Zealand

A step toward preventing Oomycete's infection through the modification of electric fields on a microfluidic device

The oomycete *Phytophthora* can cause serious threats to native flora and agriculture and food biosecurity, causing devastating diseases to plants such as kauri, oak, avocado. In New Zealand, *Phytophthora agathidicida* is the causative agent in kauri dieback and is receiving much coverage in the mainstream press as it can kill a mature kauri tree within two years. These organisms can infect their host plants via motile zoospores. These can travel between sites of infection via water in the soil.

So far, the research focused on mimicking the natural environment around the roots of the plant using microfluidic Lab-on-a-Chip (LOC) devices to investigate the electrical parameters that allow zoospores to infect plant roots. LOC devices can contain channels and chambers that allow the growth of microorganisms and the applications of physical and chemical factors. The optical properties of the devices allow me to monitor the growth and behaviour of the microorganisms in response to these factors. Plant roots can generate electric fields, which may attract zoospores. Different LOC devices have been designed that contain anodes and cathodes, which enable the study of the swimming behaviour of *Phytophthora* zoospores in the presence of different strength electric fields. Experimental result shows that zoospores tend to swim preferentially towards and then aggregate close to the cathode. These zoospores encyst and germinate, and the resultant germ tube shows chemotactic growth, also toward the cathode.

Modification of these devices will allow concurrent measurement of electro-tactic and chemotactic responses. These new devices will incorporate channels that allow the application of plant cell wall extracts, in addition to the applied electric fields. What will the response of the zoospores be, for example, if the wall extracts are applied close to the cathode – will the zoospores be more attracted to the electrical or the chemical stimulus? This research will help address the question of what the primary attractant directs infectious zoospores towards the roots of a plant. It will help in developing techniques to prevent infection. For example, if the electric fields were the primary attractant, it may be possible to design small field-based devices that are able to modify electric fields around vulnerable plants and attract zoospores away from roots and thus reduce their infective capability.

Biography:

She received a bachelor's degree in Science from the Department of Microbiology, Calcutta University, India, in 2015, and a master's degree in Microbiology from the University of Pune India, in 2017. She did her master project on determining the antioxidant and anti-microbial property of *Piper cubeba*. She is currently enrolled as a PhD researcher in the School of Biological Sciences, University of Canterbury, New Zealand. Her work focuses on the microfabrication of Lab-on-a-Chip devices to study the movement of *Phytophthora* zoospores under the influence of electric fields and to investigate means of stopping their movement.

Ghulam Zakir-Hassan[1,2] *, Faiz Raza Hassan[1], Ghulam Shabir[1] and Haroon Rafique[1]

[1]Irrigation Research Institute (IRI), Government of the Punjab, Irrigation Department, Lahore, Punjab, Pakistan

[2]School of Environmental Sciences, Charles Sturt University, Albury 2640, NSW, Australia

Irrigated agriculture and groundwater nexus under changing climate- a case study from Punjab, Pakistan

Groundwater in Pakistan underpins the food-security and livelihood especially in rural areas in Punjab province of Pakistan by playing a vital role in irrigated agriculture. Groundwater provides a buffer against supply-based canal water supplies and drought conditions. It is also source of drinking, industrial and other commercial needs. Use of groundwater has increased manifolds since last 4-5 decades and Pakistan has become 4th largest user of groundwater in the world. At present about 1.2 million private tubewells are extracting groundwater to supplement about 40-50% of the irrigation water requirements. Groundwater levels data from around more than two thousand piezometers in the Punjab province have been analysed for last 8 years both from rural as well as urban areas to evaluate the long-term response of Indus Basin Aquifer to the increasing pumpage. It has been observed that groundwater levels are dropping at very rapid rates in most of the areas at the rate ranging from 0.5 ft to 3 ft per year. This has increased the cost of pumping logarithmically. At the same time, quality of groundwater is also deteriorating with the passage of time. This situation is leading to many environmental and socio-economic threats putting livelihood of multitude of tinny rural communities under risk. Major drivers for groundwater over-mining include increasing population; uncertainty in availability of surface water-both spatial and temporal; increasing cropping intensities; deterioration of aquifer quality-due to domestic, agricultural and industrial effluents; lack of regulatory framework; lack of awareness and capacity constraints. This paper encapsulates the causes and trends of groundwater depletions, some remedial measures, and some initiatives taken recently by the government for its sustainable use.

Audience Take Away:

- Extensive use of groundwater has ranked Pakistan as 4th largest extractor of groundwater globally
- Groundwater in Punjab province of Pakistan underpins food security and livelihood
- Major consumer of groundwater in Pakistan are agriculture, domestic and industrial sector
- Agriculture is the largest consumer of groundwater where more than 90% water resources are diverted

Biography:

Mr. Zakir-Hassan is working as Director Research at Punjab Irrigation Department Lahore, Pakistan. He obtained M. Engg, degree from Asian Institute of Technology, Thailand and currently is a PhD scholar at Charles Sturt University, Australia. He has more than 25 year experience in the applied and basic research fields related to a wide spectrum of water sector issues. Has international exposure by visiting different countries including Thailand, PR China, Saudi Arabia, Australia, Iran, India, UAE, Nepal, Indonesia. Mr. Zakir is member of different national and international professional organizations like Pakistan Engineering Council, Institution of Engineers Pakistan; EWRA, Pakistan Engineering Congress; AIT Alumni Association; Aus-Awards Pakistan; ILWS-CSU, IAH; International Water Resources Association (IWRA).

Eva YuHua Kuo[1] and Tse-Min Lee[1,2]*

[1]Department of Marine Biotechnology and Resources, National Sun Yat-sen University, Kaohsiung 80424, Taiwan,
[2]Doctoral Degree Program in Marine Biotechnology, National Sun Yat-sen University, Kaohsiung 80424, Taiwan

NADPH oxidase-mediated signaling pathway mediates the high light activation of ascorbate-glutathione cycle (AGC) in *Chlamydomonas reinhardtii* against photo-oxidative stress

The ascorbate-glutathione cycle (AGC) is essential for *Chlamydomonas reinhardtii* cells to cope with high light stress. NADPH oxidase acts as key hub for the regulation of stress tolerance in plants. High intensity illumination (HL, 1,200 mol m-2 s-1) did not impact Chlamydomonas growth while the application of diphenyleneiodonium (DPI), a NADPH oxidase inhibitor, in the concentration of 5 or 10 M inhibited cell growth along with an increase of reactive oxygen species (ROS, O2.-, H2O2, and 1O2) and lipid peroxidation. The RNA-seq analysis and enzyme activity assay reveal that HL triggered an increase in CAT, APX, DHAR and GR enzyme activity and FeSOD (FSD1), APX1, DHAR1, and GSHR1 transcript abundances. But, the increase in the transcript abundances of APX1 and GSHR1 by HL was enhanced in the presence of DPI. The induction in the activity of enzymes in AGC can be inhibited in the presence of 10 M DPI, accompanied with increased ROS production. However, the increase in the transcript abundances of FSD1, APX1, DHAR1, and GSHR1 under HL condition can be enhanced in the presence of DPI. It reflects that NADPH oxidase-mediated signaling pathway modulates the induction of AGC in the ways other than mRNA level. In conclusion, the present findings demonstrate that NADPH oxidase modulates the upregulation of ascorbate-glutathione cycle for the acclimation of Chlamydomonas cells to photo-oxidative stress.

Audience Take Away:

- The role of NADPH oxidase in the regulation of antioxidant defense system has been not well studied in algae
- The present study reveals that NADPH oxidase is associated with the modulation of antioxidant defense system in *Chlamydomonas* against high light stress

Biography:

Dr. Tse-Min Lee studied Agronomy at the National Taiwan University, Taipei, Taiwan and graduated as MS in 1984. He then joined the research group of Prof. Chun Chu at the Institute of Agronomy, National Taiwan University, Taipei, Taiwan. He received his PhD degree in 1990 at the same institution. After four year postdoctoral fellowship supervised by Drs Hsieh and Lin at the Acadmia Sinica, Taipei, Taiwan, he obtained the position of an Associate Professor at the National Sun Yat-sen University, Kaohsiung, Taiwan. He has published more than 80 research articles in SCI(E) journals.

Aparna B. Gunjal
Department of Microbiology, Dr. D.Y. Patil, Arts, Commerce & Science College, Pimpri, Pune, Maharashtra, India

Plant growth promoting rhizobacteria in agriculture

The use of chemical fertilizers in agriculture for the plant growth is very harmful and causes water and soil pollution. The biological approach is very eco-friendly, easy and economical. The plant growth promoting rhizobacteria are beneficial bacteria that are useful in agriculture. They have plant growth promoting traits viz., production of iron chelating compounds called siderophores; plant hormones Indole Acetic Acid (IAA), Gibberellins and Cytokinins; solubilization of phosphorus and potassium; production of enzymes, etc. The plant growth promoting rhizobacteria can be useful in agriculture to increase the crop yield. The plant growth promoting rhizobacteria include *Burkholderia, Acetobacter, Herbaspirillum, Serratia, Bacillus* sp., etc. The biological approach to increase the plant growth will also be sustainable. The pot experiments have shown these plant growth promoting rhizobacteria are found to improve seed germination, root and shoot length, vigour index, etc. This will be ultimately helpful to the farmers in agriculture.

Biography:

Dr. Aparna B. Gunjal has completed her B.Sc. from Annasaheb Magar Mahavidyalaya, Hadapsar; M.Sc. from Modern College Arts, Commerce and Science College, Ganeshkhind and Ph.D in Environmental Sciences subject from Savitribai Phule Pune University, Pune, Maharashtra, India. She is working as Assistant Professor in Department of Microbiology at Dr. D.Y. Patil, Arts, Commerce and Science College, Pimpri, Pune, Maharashtra, India. Her research areas of expertise are solid waste management; plant growth promoting rhizobacteria; e-waste management; bioremediation; etc. Aparna has 95 publications to her credit. She has received 15 Awards for the Best Paper presentations and also received the travel grants. Aparna has also received Pune Municipal Corporation Award for excellent work in Environmental Sciences Research in 2015, The Elsevier Foundation - TWAS Sustainability Visiting Expert Programme" in 2018 and Young Researcher award with Innovative Technology. She has worked on composting aspect as a Senior Researcher Assistant at Hongkong Baptist University, Hongkong. Aparna is Reviewer for many Journals.

Charu Lata*, Pramod Prasad, O.P.Gangwar, Sneha Adhikari, Subodh Kumar, S.C. Bhardwaj

ICAR-IIWBR, Regional Station, Flowerdale, Shimla, H.P., India

Transcriptional regulation of defense responsive genes during wheat-stripe rust interactions

Stripe or yellow rust disease of wheat is caused by *Puccinia striiformis* Westend. f.sp. *tritici* (Pst) is a global threat to wheat production. Populations of Pst pathotypes evolves rapidly, limits the efficiency of plant genetic resistance and constrict the strategies of disease management. Molecular mechanisms that lead the infection and spread of disease could convey the novel strategies for deployment of rust resistance in wheat. Genetic modifications of defense responsive factors under compatible interactions could be one of the way to produce resistance towards emerging virulent pathotypes. The present study is planned to understand the interaction between Pst pathotype 78S84 in PBW 343 and FLW-3. A quantitative temporal transcription profile of selected defense related genes (caffeic acid O-methyltransferase (*COMT1*), class III peroxidase (*PRA2*), Type 1 non-specific lipid transfer protein precursor (*LTP1*), chlorophyll a/b-binding protein WCAB precursor (*WCAB*), aquaporin (*AQP1*), β-1,3-glucanase (PR1 and PR2), endochitinase (*PR4*), peroxidase (*PR9*) and phenylalanine ammonia-lyase (*PR10*)) was analyzed at different time course of infection. Under compatible and incompatible interactions, at different time course after inoculation differential expression pattern of genes was observed which indicated the different transcription levels of defense related genes in response to pathogen attack. Under compatible interactions, most of the genes were upregulated at initial time points and then transcription levels of the genes were declined. Nevertheless, under incompatible interactions transcription level was higher from 3 to 24hpi, which is considered as the favorable time for appressorial hyphae, haustorial mother cell development and formation of feeding structure. Genes *LTP, AQP1, PR1, PR2, PR4* and *PR10* confer pre-haustorial resistance under incompatible interactions. On other hand, *COMT1, PRA2, WCAB* and *PR9* genes showed higher transcription level at later stages and governs post-haustorial resistance. Under compatible interactions *LTP, AQP1, PR1, PR2, PR4 and PR10* genes performed well and showed higher transcription efficiency while under incompatible interactions transcript levels of *COMT1, PRA2, WCAB* and *PR9* genes were found significantly high. Results of this study clearly depicted the role of defense responsive genes with progression of disease under compatible and incompatible interactions.

Biography:

Charu Lata (PhD) is currently working on molecular aspects of wheat rust interactions. She had done her graduation and post-graduation in Biotechnology. In 2013 she joined ICAR-CSSRI, Karnal at division of Crop improvement. She received her PhD degree in 2019 from Kurukshetra University, Kurukshetra, Haryana, India. She joined Indian Council of Agricultural Research as scientist and posted at ICAR-Indian Institute of Wheat and Barley Research, Regional Station, Flowerdale, Shimla (HP), India. She has published 25 research articles in NAAS rated journals, 2 book chapter and more than 10 popular/technical articles.

Laura Martins de Carvalho
Center for Public Administration and Government / FGV-SP, Sao Paulo, SP, Brazil

Urban Agriculture in socially vulnerable areas of Sao Paulo, Brazil and in Lisbon, Portugal

Urban Agriculture can enable possibilities to combat structural inequalities in contexts of social vulnerability, providing: income generation; improvements in the quality of life of urban farmers; expansion in the production and access of food suitable for human consumption; and environmental preservation. In this direction, this presentation shows part of the results of research conducted in a socially vulnerable area of São Paulo, Brazil and Lisbon, Portugal. The findings for São Paulo are: (a) the growing female protagonism in agroecological urban agriculture, associated with popular entrepreneurship and the awareness of the injustices that female urban farmers face; (b) the disputes among community garden´s management models and cultivation concepts; (c) informality in access to land for urban agriculture and no guarantees of permanence in the community gardens' lands. The findings for Lisbon are: (a) Urban Agriculture is highly regulatory, materialized in the Horticultural Parks project conducted by Lisbon´s City Council; (b) untapped potential for mobilization and popular participation of urban farmers in social districts; (c) untapped potential for social-environmental innovation in initiatives led by the youth. The study concludes that the AU activity, in the studied contexts, causes a wide improvement in the quality of life of urban farmers; initiates or expands local production of food suitable for human consumption by vulnerable populations; urban agriculture practices are associated with environmental preservation and the promotion of environmental awareness through pedagogical practices. In short, urban agriculture – materialized in activities of an emancipatory, assistance or regulatory nature – has the potential to combat structural inequalities faced by vulnerable populations, contributing to social and economic transformations in large cities.

Audience Take Away:

- The audience will be able to use the insights regarding the different types of urban agriculture practices led by civil society organizations in socially vulnerable areas; the potential for mobilization and popular participation of urban farmers in social districts; and the social-environmental innovation led by the Youth involved in urban agriculture initiatives
- Scholars, civil society organizations, public servants, practitioners, and policy makers will benefit from the presentation, as multiple stakeholders produce urban agriculture in socially vulnerable areas – each with distinct agendas and interests
- Civil society organizations offer local solutions to complex social problems in socially vulnerable areas such as income generation; access to healthy food in areas of food apartheid; environmental preservation; environmental education; and women emancipation from structural inequalities and violence

Biography:

Laura Martins de Carvalho has a PhD. in Global Health and Sustainability (Faculty of Public Health – University of Sao Paulo, 2021); a Master of Science in Environment and Development (Trinity College Dublin, 2012); and a BA in Social Sciences (PUC-SP, 2007). Her research topics are on urban agriculture in socially vulnerable areas, popular entrepreneurship; urban agroecology; women empowerment through urban agriculture. She is experienced in conducting and coordinating research in disadvantaged urban communities of São Paulo, Brazil; Dublin, Ireland; Lisbon, Portugal; and in rural communities in Rwanda, Africa. She currently a research assistant at the Center for Public Administration and Government / FGV-SP and looking for potential collaborators.

Edgar Omar Rueda Puente
The Antonio Narro Agrarian Autonomous University, Mexico

The reconversion of agriculture in arid and desert areas at level word

The reconversion of crops refers to the change of product or activity that allows a better use of the soil, favors its fertility and breaks the biological cycles of pests and diseases to have an effective control and prevent them from becoming immune or resistant. Therefore, this change, whether of product or activity, represents greater economic profitability and social viability for the producer, because comparative and competitive advantages are taken advantage of, and products with value can be offered in the internal and external markets. The types of conversion that can be carried out are: change from an annual crop to another of the same cycle; change from annual crops to perennials, for example, in the area of cultivation that was destined for cereal to establish in its place a certain fruit tree, another example is when annual seasonal crops are intercropped by grasslands. Likewise, there may be shift changes between the different productive sectors, for example, when moving from an agricultural activity to a livestock or from a livestock to a forestry one.

Biography:

Dr. Edgar Rueda studied agronomy at Universidad Autonoma Agraria Antonio Narro in Saltillo, Coahuila Mexico and graduated as MS in 1996 at same institution. He received his PhD degree in 2004 at CIBNOR in California, Mexico. Currently Dr Rueda is working in Universidad de Sonora into the Agriculture Departament. He has published more than 100 research articles in SCI(E) journals

Elizabeth Kordyum*, Dmutro Dubyna
Institute of Botany, National Academy of Sciences of Ukraine, Kyiv, Ukraine

Role of phenotypic plasticity for plant adaptation to varying environments

The problem how plants as a sessile organisms survive in the varying environment, including adverse changes remains one of the most urgent of modern biology, especially in connection with forecasts of climate global change and increased man-made pressure.

We discussed the available views about numerous types of plant life strategies and mechanisms of competition and coexistence in plant communities in the light of an adaptive essence of phenotypic plasticity and its ecological significance.

In our opinion, 1) types of plant adaptive life strategies characterize only biological and ecological traits of species (cenotic types) in modern phytocenoses. Under the changes of environmental factors of natural or anthropogenic origin, plants of different cenotic types reveal phenotypic plasticity, similar in general terms, to adapt and survive in new conditions. Under the strategy of life (a life cycle), we understand the immanent ability of all living organisms to propagation, that is, the implementation of the "reproductive imperative" –- leaving offspring and preserving a species. Epigenetic systems contribute substantially in plant plasticity and adaptation to the environment due to their ability to vegetative propagation, annual growth of perennial plants (presumably clones), and apomictic propagation – adventitious embryony and apospory; 2) interrelations of sessile and autotrophic organisms eliminate competition for resources. Plants product the organic matter from water and carbon dioxide thanks to energy of sun light and a green pigment chlorophyll. Thus, plants are the first link that combines inorganic and organic worlds and underlies the further trophic chains of heterotrophic organisms in the biosphere; 3) inorganic resources needed for photosynthesis and respiration as sun light, carbon dioxide and oxygen in atmosphere are unlimited. Water and bioelements are available to all sessile components of the phytocenosis. Sunlight intensity is really different on the open area, above the canopy and under the canopy of trees. But each habitat in nature with different sunlight intensity and spectrum is occupied by plant species which the photosynthetic apparatus adapted to these conditions and works effectively; 4) coexistence (facilitation, complementarity) of species, not competing for resources, is the main mode of complicated interrelations of plants in modern phytocenoses, which exist throughout the history of mankind. Coexistence of plants in phytocenoses is conditioned by the biological peculiarities of cenotic types, namely by differences in life (morphological) forms and types of root systems, duration of ontogenesis, reproduction systems, sequence of seasonal development as well as the level of adaptive phenotypic plasticity in response to various environmental changes – climatic, seasonal and meteorological. Range of plasticity reflects the ecological and biological peculiarities of the species that make phytocenoses, their different attitude to the environment, and to each other. Just coexistence of species different on biology and ecology provides stability of phytocenoses and, thus, stability of the plant cover on Earth; 5) Restriction ideas about plant competition for resources will increase attention to other aspects of plant relationships as the basis of their coexistence in natural communities.

This report presents the original views of the authors, which can be used in discussions about the role of phenotypic plasticity in plant adaptation, specialization, population dynamics, and the interaction of plants with the environment in general.

Biography:

Dr. Edgar Rueda studied agronomy at Universidad Autónoma Agraria Antonio Narro in Saltillo, Coahuila México and graduated as MS in 1996 at same institution. He received his PhD degree in 2004 at CIBNOR in California, Mexico. Currently Dr Rueda is working in Universidad de Sonora into the Agriculture Departament. He has published more than 100 research articles in SCI(E) journals

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Yolander Youngblood*, Ineceia Carter, and Ayanna Montegut
Department of Biology, Prairie View A&M University, Prairie View, TX 77446

Case Study: A ten percent acetic acid solution is successful as a growth control agent against glyphosate susceptible and glyphosate resistant *Amaranthus palmeri* (Palmer Amaranth) when plants are young and short

In this preliminary study we investigate the responses of Glyphosate-Susceptible and Glyphosate-Resistant Amaranthus palmeri to an organic 10% acetic acid herbicide solution. Traditional herbicides are glyphosate-based. Overuse of these herbicides has led to glyphosate resistance in some plants. Amaranthus palmeri is one of them. We hypothesized that although both forms respond differently to glyphosate-based herbicides, both respond the same to organic-based herbicides that include acetic acid. In this study a 10% acetic acid solution was used versus the standard 20% acetic acid solution found in the organic agricultural vinegar herbicide because previous studies suggest that at a very young age (plants are less than ten centimeters tall), the 10% solution is strong enough to control growth. Using a lesser concentration is better for the environment since there will be less buildup over time. Using less is also less costly to the farmers' pocket. In the greenhouse Amaranthus palmeri was grown in 24 pots using Carolina® Seed Starter mix. The seeds were loosely placed in the soil about an inch from the top. Once 2 to 8 leaves per plant were apparent, the young Glyphosate-Susceptible and Glyphosate-Resistant Amaranthus palmeri leaves were sprayed with a 10% acetic acid solution. These plants are C4 plants and thus have stomata on their adaxial and abaxial leaf surfaces. Most leaves have stomata only on their abaxial surfaces. Using the JEOL Scanning Electron Microscope (SEM) we noted that stomata start responding to stress within two hours. The leaf surfaces of both plants respond the same way. Death starts to occur within 24 hours for both plant forms. The SEM micrographs show that stomata are open on the adaxial surfaces of both plant forms before they are treated. After treatment, the plants become stressed and the stomata close. However, there is a difference in the death rate. Eighty five percent (85%) of the Glyphosate Susceptible plants died within 24 hours, while 100% of the Glyphosate-Resistant plants died within 24 hours.

Biography:

Dr. Yolander Youngblood received her BS degree in Biology from the University of Southern Mississippi, USA, in 1986. She received her MS degree in Botany from the University of South Florida, USA, in 1993. In 1999 she received her PhD. in Botany from the University of Florida, USA. Currently, her laboratory is researching *Amaranthus palmeri* at Prairie View A & M University, USA, where she is a faculty member. She studies and characterizes the structural and cellular responses of leaves to certain environmental conditions, including organic herbicides. Her research is funded by the National Science Foundation.

Sellamuthu Prabakaran[1]*, Michael Alexander Gomez Cruz[2] and Mara Ivette Cano Velasquez [3]

[1]Associate Professor, School of Economics and Business Administration, Department of Accounting & Finance, Pontificia Universidad Javeriana Cali. Cali, Colombia.
[2]Financial Analystic, Manuelita Azucar y Energia , Cali, Colombia,
[3]Fabrica de Alimentos Procesados Ventolini, Cali, Colombia

Stochastic option pricing model for rainfall derivatives – A case study of sugarcane production in valle del cauca, Colombia

Sugarcane is one of the most important commercial crops and it is the most valuable crop as it is the basic raw material for the manufacture of sugar, ethanol and jaggery. Sugarcane cultivation was started in Indian Subcontinent which was exported to other countries. Colombia is the world's second largest non-centrifugal sugar producer in the world. The primary source of water for agricultural production for most of the world is rainfall and water are the key input to agricultural production and therefore fluctuations in water availability may impact agricultural productivity and revenue. Climate change and agriculture are interrelated processes, both of which take place on a global scale. Global warming affects agriculture in a number of ways, including through changes in average temperatures, rainfall, and climate extremes (e.g., heat waves); changes in pests and diseases; changes in atmospheric carbon dioxide and ground-level ozone concentrations; changes in the nutritional quality of some foods; and changes in sea level. In the past decade, the literature on weather derivatives has focused on the temperature market because most traded weather derivatives are based on temperature indices. Several economic sectors, however, are exposed to rainfall risk. For example, farmers and financial investors are affected by indirect losses caused by scarce or abundant rainfall. With rainfall derivatives, firms have the possibility to transfer precipitation risk to the capital market. The main goal of this study is to construct the Stochastic Option Pricing Model and valuation approach of Rainfall Derivatives in Valle Del Cauca, Colombia Sugarcane market and to develop a flexible framework for modelling and pricing rainfall risk. The main goal of study is fourfold: 1) First, we begin our approach to brief introduction to rainfall derivative market. 2) We construct the mathematical for making bond with rainfall derivative financial derivatives (rainfall options). 3) Then, we extend this approach to focus on valuation of option pricing model. 4) Finally, use the 10 years historical data from rainfall station, Valle Del Cauca, Colombia, study and evaluate the option pricing model. In addition, this paper ends with conclusion.

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Institute of Biological, Environmental and Rural Sciences, Aberystwyth University, Wales

Protein extracts as a biorefining product from the forage grass species Dactylis glomerata

D. glomerata (Cocksfoot) has previously been highlighted for having elevated protein contents, in comparison to other forage grass species. The biorefining of such proteins is of interest within British agriculture, as both costs and CO2 emissions from soy imports used as a livestock feed supplement could be reduced. The presented research will explore how protein contents determined by near-infra red spectroscopy (NIRS) compare to protein yield (quantified via Lowry assay) following a TCA/phenol/SDS extraction method, in freeze dried leaf tissue sub-samples cut from thrice replicated yield plots in August 2020. The estimation of total protein per hectare (NIRS and extracted) can be calculated as a product of dry matter yield, giving indication of protein yields from biorefining. Further analysis of extracted protein curds on PAGE gels will reveal the amino acid composition across four commercial varieties and eight half-sib families, identifying differences and similarities between genotypes. If substantial differences in amino acid profile are observed between genotypes, the quality of a protein extract from Cocksfoot could be dependent on the commercial variety sown, which requires consideration when cultivating the grass as a biorefining crop. This could also lead to further investigation into the genetic influence on amino acid profile and exploration of any potential improvements through selective breeding. This research is funded through the Joy Welch charitable trust.

Audience Take Away:

- Knowledge of total extractable protein yields gives indication of the biorefining potential of protein from D. glomerata
- Presented data could inform further research into scalability of protein biorefining
- Protein extracts have the potential to reduce the need for imported soy, lessening environmental impacts and improving on-farm income

Biography:

Christina first graduated with a BSc(Hons) in Plant Biology from Aberystwyth University, Wales in 2016. She remained within the Institute of Biological and Rural Sciences to study her PhD in Cocksfoot breeding for biorefining, which she has recently successfully defended during her viva voce. During her candidature, Christina gained an Associate Fellowship to the Higher Education Academy through undergraduate teaching in addition to working part-time for the Royal Society of Chemistry, delivering spectroscopy workshops to secondary school students. She now works within the Germinal Ltd. forage breeding team at Aberystwyth University.

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Effect of inoculation with Acaulospora and Glomus on growth and nutrition of Blueberry plants (*Vaccinium corymbosum*) with different fertilization levels

In recent years the demand for blueberries worldwide has been growing, due to the nutraceutical properties of the fruit that generate important benefits for human health. Colombia, due to its diversity, has a great opportunity to meet the demands of the world market. In the present study, the effect of two arbuscular mycorrhizal fungi (HFMA), of the genera Glomus (Glo) and Acaulospora (Aca) associated with blueberry plants var. Biloxi when growing on three levels of fertilization (100, 50 and 0%). The results indicate that blueberry plants inoculated with HFMA (Glo) under conditions of nutritional stress (50HFM1 +) presented an increase in dry mass (DM), plant height (AP), basal branches (RB), leaf area (AF) and root / part area ratio (R / PA), with increases in chlorophyll concentration, with statistically significant higher values with respect to treatments without inoculation with nutritional stress (0HFM- and 50HFM-). The plants inoculated with (Glo) achieved an increase in AP, while those inoculated (Aca) increased in RB, when they grew under nutritional stress in relation to the control without inoculation. The results suggest that the best association of blueberry occurs with Glomus with increased growth and nutrition (N, P, K, Ca, Mg and S).

Keywords: Blueberries, Glomus, Acaulospora, nutritional stress, mycorrhizae

Biography:

Dr. Gabriel Roveda Hoyos from the National University of Colombia, with a master's degree from the University of Wales, United Kingdom and a specialist in remote sensing applied to natural resources. Researcher and professor with 30 years of experience (CORPOICA) in the areas of agriculture, ecophysiology and microbiology and soils, with an emphasis on aspects of natural resource conservation, sustainable production and food security. I participated in the design of research, development and technological innovation proposals for Latin America, in research groups of entities such as: CORPOICA, FEDESARROLLO, public and private universities, in the integration of innovation processes with government agencies and production companies. I have worked in networks, institutional nationally and internationally with agencies such as MinColciencias, Ministry of Agriculture and Rural Development, World Bank, European Union (INCO I and II program), Procitrópicos and design of collaborative projects between countries such as Brazil, Venezuela, Peru, Guyana and Colombia. He has been a member of the International Commission on Science and Technology for Integrated Land Management, UN, Geneva and Montreux, Switzerland. I participated in forums, workshops, general policy debates and joint actions for sustainability strategies in Latin America. Co-author of publication in books / reports with around 70 scientific publications.

Manja Bozic[1]*, Ana Nikolic[1], Dragana Dudic[2], Dragana Ignjatovic-Micic[1], Jelena Vancetovic[1], Nenad Delic[1], Bojana Banovic Deri[3]

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atpI expression in different developmental stages of maize during chilling

Improving yield potential, crop quality and abiotic stress tolerance have always been some of the most important requirements for successful crop production. Poor environmental conditions arising as repercussions of climate change, like the drastically higher temperatures and drought during the summer, have become a significant cause of productivity and yield loss. Therefore, many strategies are focused on minimizing their negative effects, like changing the cropping patterns, including earlier sowing (early spring). Maize is especially sensitive to extreme heat occurring during the flowering and grain filling stages in summer, and earlier sowing enables avoiding this. However, it also means exposure to suboptimal temperatures and chilling stress during earlier developmental stages, leading to a demand for the development of maize lines tolerant to low temperatures during those stages.

In this study, 46 maize lines used in breeding programmes were grouped as Lancaster and group consisting of different heterotic groups like BSSS, Iowa dent, etc. and further studied by whole transcriptome sequencing (maize leaves, V4 stage, optimal temperature conditions). Gene expression analyses revealed a set of 77 differentially expressed genes (DEGs) between the two groups, out of which 20 were annotated as related to abiotic stress response. ATP synthase CF0 A subunit gene (atpI) was chosen for further characterization under low temperature conditions in two inbred lines (L1, L2) with most contrasting FPKM values, one belonging to each group. The experiment was performed with 5-day old and V4 maize seedlings, under optimal (25°/20°C) and low (8°/10°C) temperature conditions, with a 12h photoperiod. Samples for RNA extraction, cDNA synthesis and qPCR expression analysis were taken after 6h and 24h exposure to experimental temperatures.

The results showed different expression regulation of atpI dependent on cold exposure duration, developmental stage and genetic background. atpI expression was up-regulated in both genotypes in V4 stage, with the expression peak after 6h of treatment. In the 5-day old seedling stage, atpI expression depended on the genotype – it was down-regulated in L1, and up-regulated in L2. The expression in both genotypes in this developmental stage was at its highest after 24h of treatment. This suggests that mechanisms involved in ATP synthesis and photosynthetic phosphorylation are differentially regulated based on low temperature exposure duration, developmental stage and genetic background.

What will audience learn from your presentation?

- Bringing light to mechanisms involved in the chilling response in the early developmental stages of maize is crucial for finding and creating molecular tools that can be used further to assist in maize breeding and selection. Additionally, using atpI expression for this purpose can also be applied in the same way in other plant species.
- Since, maize is the one of the most important crops worldwide, lessening the negative effects of climate change on its production is of global importance. Finding ways of quickly and accurately predicting the maize inbreds tolerant to these changing conditions and the introgression of these traits into more susceptible genotypes is crucial. Confirming the role of atpI in the abiotic stress response could mean its inclusion in maize breeding programs, through marker assisted or possibly genomic selection, and creation of maize hybrids with superior traits.

Biography:

Manja Božić studied Biology at the University of Belgrade and graduated as MS of Plant Physiology and Molecular Biology in 2018. She started working on her PhD research shortly after joining the Laboratory for Molecular Genetics and Physiology, Maize Research Institute „Zemun Polje". She is currently working there as a research trainee and focussing on abiotic stress factors affecting maize gene expression, and how it further affects their growth and production.

HJ du Plessis[1]*, BA Egan[1], R Kleynhans[2]

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Characterization of *Hibiscus coddii* subsp. barnardii, an endemic South African species with ornamental potential

South Africa is known globally for its rich plant biodiversity and various centres of endemism, of which the Sekhukhuneland Centre of Plant Endemism (SCPE) is one. This unique floristic region is located on the ultramafic and mafic rocks of the Rustenburg Layered Suite of the Bushveld Igneous Complex. *Hibiscus coddii* subsp. *barnardii* is a particularly attractive endemic plant species growing only on the rocky outcrops of this region. This study provides information on the plant characteristics, growth conditions in its natural habitat and other plant species most commonly found in association with this endemic. The plant is a branched perennial herb with hairy leaves that produces attractive red flowers during the summer season and small, hairy seeds after pollination. These sun-loving plants occur mostly in the dry northern bushveld part of the SCPE where they are restricted to dark-colored harzburgite, pyroxenite and norite rock ridges and can withstand periods of drought. These traits make it an ideal plant for the dry South African conditions and other areas of minimal rainfall, where water-wise gardening is becoming more popular and necessary. In nature,

H. coddii subsp. barnardii plants were found to grow in soils with high levels of Mg, Fe, Ca, Ni and Cr, although in this study, they were also grown as pot plants or small shrubs in an outside garden under diverse environmental- and soil conditions. This shows that the wild *H. coddii subsp. barnardii* species can be cultivated and has the potential to be introduced to the horticulture market as a new ornamental species due to its striking appearance and water-wise properties. The research contributed further to the establishment of suitable protocols for the *ex situ* propagation and conservation of this valuable plant.

Audience Take Away:

- Be informed of the unique characteristics of an endemic South *African Hibiscus* species and its natural habitat
- Gain insight into the potential of this species as a new flowering ornamental plant in the horticulture market
- Be introduced to the importance of *ex situ* propagation methods for the commercial cultivation and conservation of the species

Biography:

Helena du Plessis completed her undergraduate- and MSc study at the University of Pretoria. She has been affiliated with the University of Limpopo since 1996 and was involved with management of various academic and administrative activities and lecturing to under- and postgraduate students in mycology, ethnobotany and plant physiology fields. She also has experience in supervision of postgraduate students in these fields. Her doctoral research was on indigenous plants of Limpopo province, South Africa with possible horticulture potential under the supervision of Prof RV Nikolova. She received her PhD degree from the University of Limpopo in 2020 with three articles stemming from this research.

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Isolation of plant-growth promoting rhizobacteria from mixed-conifer forest in Sierra Nevada, California

Climate change enhances the occurrence of extreme weather: wildfires, drought, rising summer temperatures—all of which dramatically decline forest growth and increase tree mortality in the mixed-conifer forests of Sierra Nevada, California. However, microbiota living in mutualistic relations with plant rhizospheres have been found to mitigate the effects of suboptimal environmental conditions. It is the goal of this research is to isolate native beneficial bacteria—plant-growth promoting rhizobacteria (PGPR)—that can alleviate heat stress in *Pinus ponderosa* and *Pseudotsuga menziesii* seedlings. Bacteria was isolated from the rhizosphere of *P. ponderosa* juveniles located in mixed-conifer stand, and further characterized for PGP potential based on ability to produce key growth regulatory phytohormones including auxin, cytokinin, and gibberellic acid. Out of ten soil samples taken, sixteen colonies were isolated and qualitatively confirmed to produce indole-3-acetic acid (auxin) using Salkowski's reagent. These bacterial isolates were further analyzed to quantitatively assess auxin, cytokinin, and gibberellic acid production through a variety of spectrophotometric assays. Furthermore, bioassays will be performed to determine isolates abilities to increase tolerance in heat-stressed Pinus ponderosa and Pseudotsuga menziesii seedlings. Upon completion of this research, a PGPR could be utilized to support the growth and transplantation of conifer seedlings as summer temperatures continue to rise due to the effects of climate change.

Audience Take Away:

- The practical uses of bacteria in the forest industry and their potential to be used for promoting growth in seedlings. Bacterial supplementation can act as an alternative to nutrient rich fertilizers that negatively impact surrounding fresh water ecosystems
- How to efficiently isolate and screen for plant-growth promoting rhizobacteria from the rhizosphere of juvenile conifers. The process of sampling and screening can be applied to many other plant species including those of agricultural interests
- Highlights novel bacteria previously unknown as plant-growth promoting rhizobacteria due to lack of research in mixed-conifer microbiomes
- Highlights the importance of symbiotic relationships to tolerate various environmental conditions as the effects of climate change are continuing to be studied

Biography:

Ms. Thorup studies Biological Sciences in the Master's program at California State University, Chico under the supervision of Dr. Blee and plans to graduate in 2022. Previous to her master's program, she spent four years at the same institution earning her BS, double majoring in Cellular and Molecular Biology and General Microbiology, and graduated in 2020. As an undergraduate, she joined the research group of Dr. Tran in 2018 to study coral symbiosis, and later joined Dr. Blee's laboratory group in 2019 to study bacterial transformation.

Darya H arshkova*, MSc, Monika Majewska, MSc, Elzbieta Zielinska, PhD and Anna Aksmann, PhD

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Short-term exposure to Diclofenac cause adverse effects on Green Alga *Chlamydomonas reinhardtii*

The popular nonsteroidal anti-inflammatory drug diclofenac (DCF) is one of the most common contaminants of the water environment. Its toxicity to non-target organisms is often reported to be associated with long-term (chronic) exposure. However, our results suggest that DCF can cause harmful effects even during short-term treatment. The objective of the work was therefore to estimate the acute effect of DCF on green alga *Chlamydomonas reinhardtii*, which is an accepted model of research at the physiological, biochemical and molecular level.

To achieve the goal mentioned above, *Chlamydomonas reinhardtii* CC-1690 was treated for 6h with DCF in concentration equal to the toxicological parameter EC25/24 (25% inhibition of population growth after 24h of treatment). We have found that DCF caused oxidative stress in treated cultures, in which the level of H2O2 produced by the cells reached 176% of control. Even though DCF caused no effect on the photosynthetic oxygen evolution, the detailed analysis of parameters of chlorophyll a fluorescence in vivo (OJIP test) revealed that DCF decreased the photosynthetic "vitality" of the cells (P.I. parameter) by 20% as compared to control and diminished the fraction of active PS II reaction centres (RCM parameter) by 17% as compared to control. However, when energy flux through each particular active reaction center (RC) was considered, it appeared that in DCF-treated cells the energy absorption (ABS/RC), energy trapping (TR0/RC), and electron transport (ET0/RC) were unchanged, while non-photochemical energy dissipation (DI0/RC) tend to increase. The above is in a line with our previous finding, that DCF cause transformation some RCs into "heat sinks" (silent reaction centres) while the other ones retain the same activity as in the control conditions. As regards mitochondrial activity, respiratory oxygen consumption in DCF-treated cells tend to increase (about 140% of control), however, the mitochondrial membrane potential (MMP) decreased by 17%. According to literature data, this effect could be caused by uncoupling of substrate oxidation and ADP phosphorylation and an increase in oxygen consumption via the diminishment of the constraining effect of the proton gradient on electron transport.

In conclusion, we have found that DCF can cause rapid, adverse effects on green algae cells. Oxidative stress symptoms as well as disturbance in photosynthetic and respiratory processes were seen already after 6h of exposure which indicates, that DCF poses a real threat for green algae not only due to chronic, but also acute exposure to this drug.

Acknowledgements: *This work was partially supported by the National Science Centre Poland [grant UMO-2019/35/B/NZ9/01567].*

Audience Take Away:

- Non-steroidal anti-inflammatory drugs represent a large part of pharmaceutical contaminants in aquatic environment
- One example, diclofenac (DCF), is commonly found in freshwater reservoirs and can have adverse effects on green algae, due to photosynthesis and respiration disorder
- The assessment of the physiological and biochemical effects of DCF on Chlamydomonas reinhardtii, during short-term experiments, indicate that DCF poses a real threat for green algae not only due to chronic, but also acute exposure to this drug

Biography:

After graduating from master's studies in Biological Chemistry in Belarus, I continue my education on doctoral studies at the Faculty of Biology at the University of Gdansk (Poland). The area of my scientific interests are biochemical aspects of the toxic effects of chemical substances on the cells of living organisms. While continuing my toxicological research, I changed the research model, which is currently unicellular alga Chlamydomonas reinhardtii. As part of my research, I estimate the impact of pharmaceuticals on a algal cultures using different biochemical and physiological methods. I'm author and co-author of more than 10 articles and conference papers, I did several domestic and foreign internships.

Rocha Valdez Juan Leonardo*; Rocha Quinones Juan Leonardo; Avila Cisneros Rafael; Gonzalez Avalos Ramiro; Rodriguez Dimas Norma

Antonio Narro Autonomous Agrarian University of the Department of Basic Sciences of the Highway to Santa Fe and Periférico Raúl López Sánchez S / N, Col. Valle Verde, Torreón Coahuila Mexico

Effects of climate change on the development of beans (*Phaseolus vulgaris L.*) in the Lagunera region.

Climate change has in some way affected the temperature of the environment, so that the increase in heat, the decrease in the rainy seasons, as well as the presence of early frosts and / or the anticipation of late frosts are considered among other factors. that can affect the development of the bean crop (Phaseolus vulgaris L.)

Method: The research was carried out in an experimental field of the Antonio Narro Autonomous Agrarian University in the city of Torreón Coahuila Mexico located in the San Antonio de los Bravos ejido, three different varieties of beans were used: Pinto Centauro, Pinto Saltillo and Pinto Bravo through a randomized block design with three replications each, where three sowing dates were made with an interval of 7 days. The first sowing date was May 22, 2020, the second sowing date was May 29, 2020 and the third sowing date was June 5 to generate an approximate projection of 170,000 plants per hectare.

Result: The ANOVA method for a single factor was used to compare seed germination, vegetative development of plants and bean production. It was validated with the Tukey test with a reliability of 95 percent. Obtaining that there is a significant difference in the production of beans and in the vegetative development of the plant, showing no significant difference in the germination of seeds, thus rejecting the null hypothesis for bean production and for vegetative development of the plant and the null hypothesis is accepted for germination.

Conclusion: By using three different sowing dates, it was observed how the phenomena caused by climate change can affect the development of the crop, during the research atypical rains occurred during the flowering season, causing the flower to fall, affecting bean production. In addition, in the presence of excessive humidity, the presence of the fungus Sclertotium rolfsii.Sac developed. fungus that produces the drying of the plant causing in some lots a prevalence of 60% up to 70% of the population of the lot, mainly in the first two sowing dates. In this sense, the significant difference produced by the rejection of the null hypothesis is interpreted, both in vegetative development and in bean production, with respect to germination the null hypothesis is accepted because at the time of this process there were no Atypical meteorological phenomena, so it is recommended to continue with the research work modifying sowing dates until the optimal production date is found.

Keywords: Climate change, diseases, vegetative development

Audience Take Away:

- Effects of climate change on the development of beans (Phaseolus vulgaris L.)
- Affecting bean production on different sowing dates in the bean crop (Phaseolus vulgaris L.)
- The prevalence of the fungus Sclertotium rolfsii.Sac.in bean cultivation (Phaseolus vulgaris L.)

Biography:

Phytotechnical Agronomist Engineer. 1985 UAAAN.

Postgraduate in Business Administration. 1998 UAdeC

Doctorate in Strategic Administration. 2013 IIAE

Candidate for a Doctor of Administration and Senior Management. UAdeC

Certificate in Labor Competencies for the delivery of human capital training courses.

CEO of the UAAAN Center for Basic and Applied Research Researcher

Professor of the subjects of Biostatistics and Introduction to Statistics at the Antonio Narro Autonomous Agrarian University

Head of the Department of Basic Sciences at the Antonio Narro Autonomous Agrarian University

Author of the book Biostatistics applied to veterinary medicine and livestock research in 2017.

Author of the book Principles of Biostatistics in 2019.

Co-author in four scientific publications in an indexed journal in 2019.

Advisor in eight investigations for bachelor thesis in 2019.

Speaker at National and International Congresses.

Rocha Quinones Juan Leonardo*; Avila Cisneros Rafael; Gonzalez Avalos Ramiro; Pena Revuelta Blanca Patricia; Rodríguez Dimas Norma

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PDCA application in bean cultivation in Northern Mexico

Antonio Narro Autonomous Agrarian University of the Department of Basic Sciences of the Highway to Santa Fe and Periférico Raúl López Sánchez S / N, Col. Valle Verde, Torreón Coahuila Mexico

Among the five varieties registered in 2010 by the INIFAP network of beans and other grain legumes in Durango is Pinto Bravo, which has been evaluated in different environments to establish its level of tolerance to environmental factors, which reduce productivity and grain quality. Among the factors that reduce bean productivity in the Semi-arid Altiplano, is humidity stress, which is caused by scant and erratic distribution of rain and edaphic conditions, such as sandy, shallow soils, poor in organic matter. and with low moisture retention capacity. (Rosales Serna and Collaborators; 2011).

Climate change is the greatest environmental threat facing humanity, it is the evil of our time and its consequences can be devastating if we do not drastically reduce our dependence on fossil fuels and greenhouse gas emissions. In fact, the impacts of climate change are already perceptible and are evidenced by data such as:

- The global average temperature has already risen 1.1 ° C.
- Damage to crops and food production.
- Extreme meteorological phenomena. (Greenpeace; 2019)

PDCA is a management method that corresponds to the actions necessary to guarantee the solution of a problem. The problem can be good, when it is better than the goal, or bad when it comes to unwanted deviations in a certain pattern. The objective of the PDCA cycle is to guarantee a process of continuous improvement, where the treatment of anomalies is guaranteed, seeking to increase productivity. (Rock Content and collaborators; 2018).

Objective: Apply the PDCA methodology to evaluate the germination efficiency of the various bean plant varieties (Bravo, Centauro and Saltillo), forecasting and eliminating potential risks, with the use of quality tools that allow to identify, measure and try to control the process with the help of statistical analysis using the statistical package MINITAB.

Method: The experiment was developed in the period May-September 2020 in the San Antonio de los Bravos experimental field of the Antonio Narro Autonomous Agrarian University in a geographic location of North Latitude: 250 33´ 21 ", West Longitude: 1030 22´ 36 In the city of Torreón Coahuila Mexico. Three varieties of beans (Phaseolus vulgaris) were used: Pinto Bravo, Pinto Centauro and Pinto Saltillo by means of a random block design with three repetitions each.

Results: The ANOVA method for a single factor was used to compare seed germination, plant height and stem thickness, validating with the Tukey test with a reliability of 95 percent. Obtaining that there is no significant difference in seed germination, plant height and stem thickness, so the null hypothesis is accepted for these variables. In the first stage, the Plan stage, variables such as sowing technique, dates and irrigation technique, quantity and technique of fertilizer use, quantity and technique in the use of insecticides, plant germination, plant size, thickness, and climate, considering pest infection as a

risk for the second stage of Making, the quality tool was used to generate solutions to control the process and thus reduce the possibility of potential risks occurring, in the third stage of Check, favorable results are observed that generate a normalized behavior in the variables that allowed to control the process and for the last stage, Acting based on the results, a germination greater than 70% was observed, as well as an increase of up to 30% in the size of the plant, with respect to production, was affected by atypical weather situations.

Conclusions: When using three different sowing dates, a normal trend was observed in the planting, germination and vegetative development process of the plant. With regard to grain production, the development of the crop was affected by the occurrence of atypical climatic phenomena, however the use of the PDCA methodology allows a better control of variables implicit in the establishment and development of the crop. continue with the research work to replicate the project by modifying sowing dates that will serve as a basis for future agricultural cycles which will allow us to anticipate these atypical situations, managing to control the process, without being affected by the climate of the region.

Keywords : PDCA, temperature, germination

Audience Take Away:

- Present an alternative to increase productivity and reduce variability and / or eliminate failures / defects using as the main variable the impact of climate change on different planting dates using three different bean variables, it can be applicable for any production system agricultural.
- Use the MINITAB statistical software and quality tools that allow us to carry out the four stages: Plan, Do, Control and Act. And thus be able to control agricultural processes and anticipate possible failures from the use of the methodology based on the PDCA methodology.

Biography:

Industrial Engineer with a specialty in Quality and Productivity. 2017 ITL.

Postgraduate in Business Administration Quality and Productivity. 2019

Universidad Tec Milenio Certified in Green Belt SIGMA PRO INC. 2019

Research professor of the subjects of Biostatistics and Introduction to Statistics at the Antonio Narro Autonomous Agrarian University

Co-author of the book Principles of Biostatistics in 2019.

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From gaming to high throughput phenotyping: Use of an X-box camera to model soybean 3D structure and morphological traits

Abstract: The world population increase coupled with the depletion of natural resources are a dangerous combination that is threatening humanity and other life around the world. At the current rate, crop production must be doubled by 2050 in order to meet population demand. High throughput phenotyping in agriculture has drawn increasing interest in recent years. This research introduces an unprecedented sensor, Kinect sensor, for 3D assessment of crops on a high-clearance tractor platform. The development of crop canopy 3D models, and calculation of canopy traits such as plant height, number of pods per node, etc can be achieved through light detection and ranging scanners (LIDAR). However, its complexity and high cost makes this technology difficult to implement for research and breeding proposes. The advantage of Kinect sensor besides its price, $200 per unit, is the ability to capture depth images from as many viewing angles as possible. Depth images can then be converted to point clouds, which will be further processed and combined to form a single and complete 3D model of the plant. Those 3D models can help to extract phenotypes of plants such as plant height, canopy area, number of pods per plant, and node, will provide valuable information for agronomists, breeders, geneticists, and physiologist to study their correlation with growth, resistance to biotic and abiotic stresses, and ultimately yield. Except Kinect sensors, some other sensors are also deployed on the platform, including ultrasonic sensors, thermal sensors, and spectrometers to monitor plant height, crop canopy temperature, and canopy reflectance, respectively.

Audience Take Away:

- Kinect is the alternate technology of LIDAR in Agriculture
- 3D structure of plants could be extracted from Kinect images
- Numerous information of plants can be obtained from the 3D imag
- Importance of this high throughput technology

Biography:

Dr. Bai studied Bioengineering at University of Arkansas, USA and graduated as MS in 2012. She then joined the research group of Dr. Larry Purcell at University of Arkansas, USA. She received her PhD degree in 2016 majoring at Agronomy and Crop Science, at the same institution. After three year postdoctoral fellowship supervised by Dr. Felix Fritschi at University of Missouri, USA, she obtained the position of an Assistant Professor at Northwest Missouri State University.

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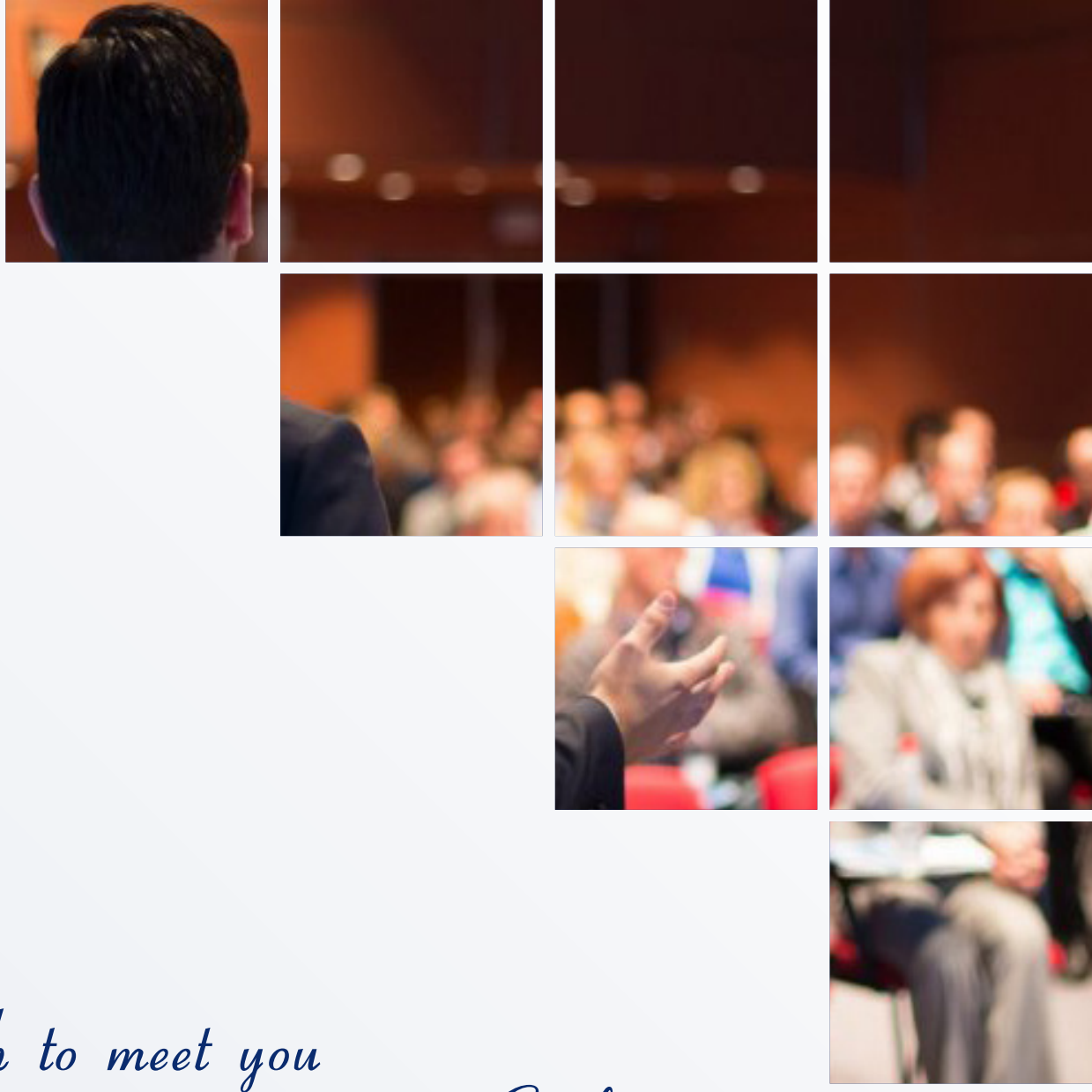

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