CONFERENCE PROCEEDINGS

8th International Conference on Silicon in Agriculture

Sheraton New Orleans Hotel
New Orleans, Louisiana USA
May 23-26, 2022

LSU AgCenter
Research · Extension · Teaching

ISSAG
International Society for Silicon in Agriculture and Related Disciplines

8th International Conference on Silicon in Agriculture

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ORGANIZING COMMITTEE

Dr. Brenda Tubana, Chair
Dr. James Villegas
Dr. Lawrence Datnoff
Louisiana State University AgCenter, Baton Rouge, LA

Dr. Fabrício A. Rodrigues
Viçosa Federal University, Department of Plant Pathology, Viçosa, MG, Brazil

PLENARY SPEAKER

Dr. Scott Johnson, Western Sydney University, Australia

KEYNOTE SPEAKERS

Dr. Prakash Nagabovanalli, University of Agricultural Sciences, Bangalore, India
Dr. Clistenes Nascimento, Federal University of Pernambuco, Recife, Brazil
Dr. Miroslav Nikolic, University of Belgrade, Belgrade, Serbia
Dr. Olivia Reynolds, Charles Sturt University, Australia
Dr. Wendy Zellner, The University of Toledo, Ohio, USA

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Collins Kimbeng, LSU AgCenter Sugar Research Station
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Foreword

We would like to welcome everyone to New Orleans, Louisiana, USA, the site of the 8th International Conference on Silicon in Agriculture (ICSA). After 23 years, the conference is once again hosted in the US. Since then, the conference is held every three years and has become the venue for the silicon scientific community and industry to meet and share the latest information on silicon research in agriculture as well as foster camaraderie among the participants from around the world. We also discuss issues and research opportunities, and collaborations. The 8th ICSA theme "Innovate and Integrate Silicon Research for Sustainable Agriculture" reflects our awareness as a community of the evolving needs and challenges in agriculture.

The conference proceedings consist of 53 research abstracts in oral (25) and poster (28) presentations. We have research topics on the role of silicon in alleviating biotic and abiotic stress in plants and updates on the analytical procedures for determining silicon in soils and plants. The presentations on the implications of silicon in agricultural systems and climate change are well in tune with the conference theme. Elucidating the function of silicon at the plant cellular level and the introduction of new silicon sources are the focus of several presentations. Graduate students are presenting highlights of their research through the 5-minute rapid oral and poster presentations. All these outcomes indicate our resiliency and determination to continue our work, despite all challenges encountered and set-backs during the peak of the worldwide COVID-pandemic.

We would like to thank our sponsors for their generous financial support and for working with us to ensure the success of this conference. We thank you all for your patience. Indeed, this conference has been long overdue, and the 8th ICSA organizing committee could not be more delighted to finally open the conference to everyone.

Sincerely,

8th ICSA Organizing Committee

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CONFERENCE PROGRAM

May 23, 2022

5:00 – 6:30	PM	**Early Registration** **Sponsors Table Set-up** **Posters Set-up**	Rhythms I Lagniappe Rhythms I
6:30 – 10:00	PM	**Reception**	Waterbury Ballroom

May 24, 2022

7:00 – 9:00	AM	**Continental Breakfast** **Registration** **Sponsors Table Set-up** **Posters Set-up** **Upload Presentations**	Waterbury Ballroom Rhythms I Lagniappe Rhythms I Waterbury Ballroom
9:00 – 9:10	AM	**Conference Opening** Dr. Brenda Tubana President ISSAG	Waterbury Ballroom
9:10 – 9:25	AM	**Welcome Remarks** Dr. Michael Salassi LSU AgCenter Associate Vice President Program Leader for Plant and Soil Sciences	Waterbury Ballroom
9:25 – 10:00	AM	**Plant Silicon Interactions between Organisms and the Implication for Agroecosystems** Dr. Scott Johnson Plenary Speaker	Waterbury Ballroom
10:00 – 10:30	AM	**Break/Poster Viewing/Exhibit**	
10:30 – 1:55 PM	**Program Theme I: Role in Biotic and Abiotic Stress** ***Moderator:*** *Dr. Miroslav Nikolic* ***Timekeeper:*** *Dr. Jelena Pavlovic*		Waterbury Ballroom
10:30 – 11:00	AM	**Keynote: Silicon-Facilitated Plant Defense Against Biotic Stress: Recent Advances** Dr. Olivia Reynolds Charles Sturt University	
11:00 – 11:20	AM	**Silicon Alleviates Antimony Phytotoxicity in Giant Reed** Dr. Marek Vaculik Comenius University in Bratislava	
11:20 – 11:40	AM	**The Effect of Foliar Application of Silicon on the Expression of Genes Involved in Plant Response to Stress** Dr. Anna Konieczy INTERMAG	

11:40 – 12:00	AM	**Effect of Silicon Application on Orange Rust Control in Different Sugarcane Varieties** Dr. Bruno Nicchio Federal University of Uberlandia	
12:00 – 1:00	PM	**Lunch**	Lagniappe
1:00 – 1:20	PM	**Effect of Soil Silicon Amendment on Rice Insect Pest Complex in Louisiana** Dr. James Villegas LSU AgCenter	
1:20 – 1:35	PM	**Benefits of Silicon Fertilization in Contrasting Sugarcane Cultivars to Drought-Tolerance Subjected to Late Water Deficit** Dr. Monica Camargo Agência Paulista de Tecnologia dos Agronegócios	
1:40 – 1:55	PM	**Program Theme I Panel Discussion** ***Moderator:*** *Dr. Miroslav Nikolic* ***Timekeeper:*** *Dr. Jelena Pavlovic*	
1:55 -3:00	PM	**5-Minute Rapid Oral Competition (Graduate Students)** ***Moderator:*** *Dr. Brenda Tubana* ***Timekeeper:*** *Dr. Marilyn Dalen*	Waterbury Ballroom
3:00 – 3:30	PM	**Break**	
3:30 – 4:30	PM	**Poster General Session** **Poster Graduate Student Presentation**	Rhythms I
4:30 – 6:30	PM	**Big Easy Ghost Tour** ***Coordinator****: Dr. James Villegas*	Meeting Place: Waterbury Ballroom
7:00 – 10:00	PM	**Cultural Night** ***Hosts:*** *Drs. Henk-Maarte Laane & Brenda Tubana* ***Music:*** *Dr. Jazz and the New Orleans Sounds*	Waterbury Ballroom

May 25, 2022

7:00 – 8:00	AM	**Continental Breakfast**	Waterbury Ballroom
8:00 – 9:45		**Program Theme II: Chemistry and Analysis of Silicon in Soils and Plants** ***Moderator:*** *Dr. James Villegas* ***Timekeeper:*** *Dr. Marilyn Dalen*	Waterbury Ballroom
8:00 – 8:30	AM	**Keynote: Extraction and Estimation of Si in Soils and plants: Downsides and Front-Line Appraisals** Dr. Nagabovanalli B. Prakash University of Agricultural Sciences	

8:30 – 8:50	AM	**The Correlation between Amorphous Content and Soluble Silica of Calcium Silicate Slags Using X-Ray Diffraction and Colorimetric Analysis** Jessica Lyza Edward C. Levy Corporation	
8:50 – 9:10	AM	**Effect of Slag Based Gypsum on Silicon Availability, Uptake and Yield of Rice, Maize, and Groundnut in India** Dr. Prabhudev Dhumgond University of Agricultural Sciences	
9:10 – 9:30	AM	**Condensed Silica as a New Source for Si-Fertilizer with Huge Potentials** Tor S. Hansen Elkem Materials	
9:30 – 9:45	AM	**Program Theme II Panel Discussion** ***Moderator:*** *Dr. James Villegas* ***Timekeeper:*** *Dr. Marilyn Dalen*	
9:45 – 10:15	AM	Break/Poster Viewing/Exhibit	
10:15 – 12:00		**Program Theme III: Plant Growth, Development and Metabolism** ***Moderator:*** *Dr. Fabricio Rodrigues* ***Timekeeper:*** *Dr. Marilyn Dalen*	Waterbury Ballroom
10:15 – 10:45	AM	**Keynote: Beyond Biosilicification and the Cell Wall: How Does Silicon Function as a Plant Nutrient?** Dr. Wendy Zellner The University of Toledo	
10:45 – 11:05	AM	**Genes Related to Silicon Transport and Accumulation in Selected Crops** Dr. Boris Bokor Comenius University in Bratislava	
11:05 – 11:25	AM	**Silicon Fertilization and Paddy Field** Dr. Chanchal Malhotra Baba Mastnath University	
11:25 – 11:45	AM	**Elucidating Silicon Responses with Nicotiana tabacum** Dr. Scott Leisner The University of Toledo	
11:45 – 12:00	AM	**Program Theme III Panel Discussion** ***Moderator:*** *Dr. Fabricio Rodrigues* ***Timekeeper:*** *Dr. Marilyn Dalen*	

12:00 – 1:00	PM	**Lunch**	Lagniappe
1:00 – 2:35		**Program Theme IV: Agricultural Systems, Climate Change and Ecology** ***Moderator:*** *Dr. Brenda Tubana* ***Timekeeper:*** *Krizzia Guardado*	Waterbury Ballroom
1:00 – 1:30	PM	**Keynote: Silicon Soil-Plant Dynamics in Nutrient-Poor Environment** Dr. Miroslav Nikolic University of Belgrade	
1:30 – 1:45	PM	**Soil Application of Calcium Silicate Slag and the Effects on Soil pH, Crop Yield and Quality of Corn, Potatoes, Tomatoes and Cucumbers Grown in Michigan Soils** Dr. Patrick McGinnity Edward C. Levy Corporation	
1:45 – 2:00	PM	**The Effect of Particle Size on the Solubility and Release of Monosilicic Acid from Silicate Slag and Silicon Uptake by Wheat (*Tritium aestivum*)** Dr. Wooiklee Paye New Mexico State University	
2:00 – 2:15	PM	**The Effects of Stabilized Silicic Acid on Fish and Shrimps** Dr. Henk-Maarte Laane ReXil Agro	
2:15 – 2:30	PM	**Silica Uptake and Effects in Forest Tree Plants** Tommy Landberg Stockholm University	
2:30 – 2:40	PM	**Program Theme IV Panel Discussion** ***Moderator:*** *Dr. Brenda Tubana* ***Timekeeper:*** *Krizzia Guardado*	
2:40 – 2:55	PM	**Break/Poster Viewing/Exhibit**	
2:55 – 4:30		**Program Theme V: Biostimulant, Soil Amendment, and Fertilizer: What's New in the Industry** ***Moderator:*** *Dr. Wendy Zellner* ***Timekeeper:*** *Krizzia Guardado*	Waterbury Ballroom
2:55 – 3:25	PM	**Keynote: Crop Response to Silicon Fertilization in Northeastern Brazil** Dr. Clistenes Nascimento Federal University of Pernambuco	

3:25 – 3:40	PM	**Questions and Answers About Root Silicification** Dr. Alexander Lux Comenius University in Bratislava	
3:40 – 3:55	PM	**Alkali-Enhanced Biochar as a Soil Amendment for Providing Plant-Available Si** Dr. Jim Wang LSU AgCenter	
3:55 – 4:10	PM	**Magnesium Silicate and Its Potential Use for Agricultural Production in Colombia** Dr. Carlos Gauggel Mg12 ZOMAC SAS	
4:10 – 4:25	PM	**A New Alternative Source for Si-Fertilizer by Using Ground SiMn-Slag** Tor S. Hansen Eramet Norway	
4:25 – 4:35	PM	**Program Theme V Panel Discussion** ***Moderator:*** *Dr. Wendy Zellner* ***Timekeeper:*** *Krizzia Guardado*	
4:35 – 5:30	PM	**Business Meeting** **Presiding,** Dr. Brenda Tubana **ISSAG** (Financial Report, Board Members Nomination) **Recognition,** Dr. Lawrence Datnoff **Graduate Student Winners,** Dr. Clistenes Nascimento **Appointment New President & Site of 9th ICSA**	Waterbury Ballroom
5:30 – 6:30	PM	**ISSAG Officers and Board Members Meeting**	TBA
6:30	PM	**Dinner in the Big Easy (on your own)**	

May 26, 2022

7:00 – 8:00	AM	**Continental Breakfast**	Waterbury Ballroom
8:30 AM – 7:00 PM		**Tour to Baton Rouge** **Coordinator:** Dr. Brenda Tubana LSU AgCenter Soil Fertility Team	Hotel Front Parking Area
8:00 – 8:30	AM	**Bus Boarding**	
8:30	AM	**Depart**	
10:00 – 11:30	AM	**LSU AgCenter Sugar Research Station** Dr. Collins Kimbeng, Sugarcane Breeding & Genetics Dr. Michael Pontiff, Plant Breeder	
12:00 – 2:30	PM	**Lunch @ LSU AgCenter Botanic Garden at Burden** Dr. Jeff Kuehny, Resident Director	
3:00 – 5:00	PM	**Baton Rouge Downtown**	
5:00	PM	**Depart for New Orleans**	
7:00	PM	**Arrive at Sheraton New Orleans Hotel** **Dinner (on your own)**	

Silicon Enhances Biosynthesis of Organic Acids in Zinc-Deficient Rice

Jelena Pavlovic[1], Lourdes Hernandez-Apaolaza[2], Tijana Dubljanin[1], Miroslav Nikolic[1]

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Poster Presentation #17, Rhythms I

ABSTRACT

Zinc (Zn), an essential micronutrient for crops, is involved in a variety of physiological processes. The Zn deficiency mainly affects generative growth and seed development and being a component of the antioxidant machinery (*e.g.*, Cu/Zn-SOD) is conductive to oxidative stress in plant tissues. Rice is a typical silicon (Si)-accumulating species, which is strongly affected by Zn deficiency in the alkaline, low Zn soils, especially high in phosphate and/or organic matter. Yet, little is known about the interaction between Si and Zn in rice plants under Zn-deficient conditions. We investigated the effect of Si nutrition on Zn tissue distribution and biosynthesis of organic acid in rice plants subjected to short-term (up to 7 days) and long-term (28 days) Zn deficiency. Tissue concentrations of organic acids by HPLC in parallel Zn and Si by ICP-OES were measured. The Si addition to the nutrient solution successfully mitigated visual symptoms of Zn-deficiency stress and significantly increased dry biomass of rice plants. Interestingly, during the short-term experiment, +Zn plants supplied with Si showed significantly lower Zn concentration in the shoots, but significantly higher Zn concentration in the roots. Also, in the -Zn plants supplied with Si, the concentration of Zn in root tissue rapidly decreased to the level of -Si/-Zn plants, which was followed by an increased concentrations of both organic acids and Zn in the shoots. In the long-term experiment, however, Si did not affect Zn concentration in roots nor in shoots of -Zn plants, but Si differently affected organic acid profile and their tissue accumulation depending on the plant organ and Zn status. In conclusion, Si supply enhanced root-to-shoot translocation of Zn mediated by organic acid ligands during the first 7 days of Zn deficiency.

Keywords: Silicon nutrition, Oxidative stress, Plant nutrition