PROGRAM & ABSTRACT BOOK

GreenSys 2023

International Symposium on New Technologies for Sustainable Greenhouse Systems

Joinly with IV International Symposium on Organic Greenhouse Horticulture

22–27 October, 2023

Cancún, México

greensys2023.org

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Welcome message

Dear colleagues,

The GreenSys2023: International Symposium on New Technologies for Sustainable Greenhouse Systems jointly with the IV International Sympoisum on Organic Greenhouse Horticulture will be held in Cancún, México, from October 22th to 27th 2023. It is our pleasure to host this conference and invite you to attend.

This event is an opportunity to bring together scientists, researchers, technicians and other professionals to present their scientific and technological innovations in greenhouse horticulture and other controlled environment horticultural systems, to share their ideas and knowledge and discuss the state-of-the-art and future perspectives for the controlled environment horticulture sector with emphasis in the sustainability issues.

Cancún is an international touristic destination located at the Caribbean Sea to the east of the Yucatan Peninsula of México. It has 23 km of paradisiac beaches. Close to the Mayan Riviera which has about 140 km of shores and beaches of the Caribbean Sea. Visiting Cancún is a great opportunity to get acquainted with the Mayan' ancient culture by exploring the archeological sites around the Yucatan Peninsula such as Chichén Itzá an UNESCO World Heritage Site and others as Tulum, Calakmul and Uxmal. People who love nature, around Cancún will find several islands such as Cozumel, Isla Mujeres, Holbox Isla and aquatic attractions like Interactive Aquarium, Cenotes (2000 across Yucatan) and Bacalar Lagoon. You can also enjoy the natural rain forest ecosystem visiting Xcaret, Xelha, Kabah Park and Tulum.

We are convinced that you will enjoy your stay in Cancún, from the scientific sessions to the touristic and cultural programs that we will prepare for you. We look forward to seeing you all during the GreenSys2023 and the IV organic greenhouse horticulture symposia.

The Conveners,

Irineo Lorenzo López-Cruz and Efrén Fitz-Rodríguez / *Agricultural Engineering Graduate Program and Department of Mechanical Engineering, Universidad Autónoma Chapingo, Chapingo, Texcoco, México*

Martine Dorais / *Département de Phytologie Faculté des sciences de l'agriculture et de l'alimentation, Université Laval, Québec, Canada*

Conveners

Irineo Lorenzo López-Cruz
Agricultural Engineering Graduate Program and Department of Mechanical Engineering, Universidad Autónoma Chapingo, Chapingo, Texcoco, México

Efrén Fitz-Rodríguez
Agricultural Engineering Graduate Program and Department of Mechanical Engineering, Universidad Autónoma Chapingo, Chapingo, Texcoco, México

Martine Dorais
Département de Phytologie Faculté des sciences de l'agriculture et de l'alimentation, Université Laval, Québec, Canada

Organizing committee

Name	Institution	Country
Dr. Irineo Lorenzo López Cruz	Universidad Autónoma Chapingo (UACh)	
Dr. Efrén Fitz Rodríguez	Universidad Autónoma Chapingo (UACh)	
Dra. Raquel Salazar Moreno	Universidad Autónoma Chapingo (UACh)	
Dr. Abraham Rojano Aguilar	Universidad Autónoma Chapingo (UACh)	
Dr. José Armando Ramírez Arias	Universidad Autónoma Chapingo (UACh)	
Dr. Mauricio Carrillo García	Universidad Autónoma Chapingo (UACh)	
Dr. Joel Pineda Pineda	Universidad Autónoma Chapingo (UACh)	
Dr. Alejandro F. Barrientos Priego	Universidad Autónoma Chapingo (UACh)	
Dr. Carlos Alberto Villaseñor Perea	Universidad Autónoma Chapingo (UACh)	
Ing. Abraham Cortés Hernández	Universidad Autónoma Chapingo (UACh)	
MI. Luis Daniel López Zea	Universidad Autónoma Chapingo (UACh)	
Dr. Waldo Ojeda Bustamante	Colegio Mexicano de Ingenieros en Irrigación (COMEII)	
Dr. Jorge Flores Velázquez	Colegio de Postgraduados (CP)	
Dr. Manuel Sandoval Villa	Colegio de Postgraduados (CP)	
Dr. Enrique Rico García	Universidad Autónoma de Querétaro (UAQ)	
Dr. Ramón Gerardo Guevara González	Universidad Autónoma de Querétaro (UAQ)	
Dr. Ernesto Olvera González	Tecnológico Nacional de México (TecNM)	

Scientific committee

Name	Institution	Country
Abdulaziz Al-Harbi	National Research and development center for sustainable Agriculture (Estidamah)	
Abraham Rojano-Aguilar	Universidad Autónoma Chapingo (UACh)	
Armando Ramirez-Arias	Universidad Autónoma Chapingo (UACh)	
Assumpción Antón	IRTA, Barcelona	
Ariane Grisey	CTIFL, Institute for Applied Research on Fruit and Vegetables	
Beatrix Alsanius	Swedish University of Agricultural Sciences	
Cecilia Stanghellini	Wageningen UR Greenhouse Horticulture	
Diego Valera-Martínez	University of Almeria	
Dietmar Schwarz	Leibniz Institute for Vegetable and Ornamental Crops	
Eddie Schrevens	K University of Leuven	
Eiji Goto	Graduate School of Horticulture, Chiba University	
Ep Heuvelink	Wageningen UR Greenhouse Horticulture	
Esteban Baeza	Wageningen UR Greenhouse Horticulture	
Etienne Chantoiseau	Agrocampus Ouest	
Evelia Schettini	University of Bari	
Fatima Baptista	MED - Mediterranean Institute for Agriculture, Environment and Development University of Évora	
Efrén Fitz-Rodríguez	Universidad Autónoma Chapingo (UACh)	
Enrique Rico-García	University of Querétaro	
Fabio Tittarelli	CRA-RPS, Rome	
Francisco Domingo Molina-Aiz	University of Almeria	
Gene Giacomelli	University of Arizona	
Gerben Messelink	Wageningen UR, Greenhouse Horticulture	
Giacomo Scarascia-Mugnozza	University of Bari	
Giuliano Vox	University of Bari	
Guohong Tong	Shenyang Agricultural University	
Hicham Fatnassi	INRAE - French National Institute for Agriculture, Food, and Environment	
Ido Seginer	TECHNION. Israel Institute of Technology	

Name	Institution	Country
In-Bok Lee	Seoul National University	
Irineo López Cruz	Universidad Autónoma Chapingo (UACh)	
Jean-Claude Roy	Université de Bourgogne franche-Comté, Institut FEMTO-ST	
Jérôme Lambion	GRAB	
Joelle Herforth-Rahmé	FiBL, Switzerland	
Jose Tanny	Institute of Soil, Water and Environmental Sciences, Agricultural Research Organization. Volcani Center	
Joel Pineda-Pineda	Universidad Autónoma Chapingo (UACh)	
Jorge Flores-Velázquez	Colegio de Postgraduados	
Jung-Eek Son	Seoul National University	
Kamel Mesmoudi	University of Batna	
Kurt Möller	Universität Hohenheim	
Leen Janmaat	Louis Bolk Institute	
Leo Marcelis	Wageningen UR – Horticulture and Product Physiology	
Manuel Sandoval-Villa	Colegio de Postgraduados	
Meir Teitel	Agricultural Research Organization. Volcani Center	
Michael Raviv	Newe Ya'ar Research Center, ARO	
Michel Verheul	Bioforks, Norway	
Ming Li	National Engineering Research Center for Information Technology in Agriculture (NERCITA)	
Murat Kacira	University of Arizona	
Nadia Bertin	INRAE - French National Institute for Agriculture, Food, and Environment	
Nazim Gruda	University of Bonn	
Nikolaos Katsoulas	University of Thessaly	
Pierre-Emmanuel Bournet	Agrocampus Ouest	
Pilar Lorenzo	IFAPA Almeria	
Pradeep Kumar	ICAR-Central Arid Zone Research Institute	
Ramón Guevara-González	University of Querétaro	
Raquel Salazar-Moreno	Universidad Autónoma Chapingo (UACh)	
Rodney Thomson	University of Almeria	

Name	Institution	Country
Sasan Aliniaeifard	University of Tehran	
Silke	Wageningen UR Greenhouse Horticulture	
Stefania De PASCALE	University of Naples Federico II	
Stephanie Burnett	University of Maine	
Takehiko Hoshi	Kindai University	
Tao Li	Institute of Environment and Sustainable Development in Agriculture, CAAS	
Thierry Boulard	INRAE - French National Institute for Agriculture, Food, and Environment	
Thomas Bartzanas	Agricultural University of Athens	
Toyoki Kozai	Japan Plant Factory Association	
Ulrich Schmutz	Coventry University, UK	
Uwe Schmidt	Humboldt-Universität zu Berlin	
Weihong Luo	Nanjing Agricultural University	
Wim Voogt	Wageningen UR, Greenhouse Horticulture	
Xiuming Hao	Agriculture and Agri-Food Canada	
Martine Dorais	Université Laval	
Sase Sadanori	Nihon University	
Yousse Rouphael	University of Naples, Federico II	
Yuksel Tuzel	Ege University	
Mathala Juliet Gupta	ICAR-Central Coastal Agricultural Research Institute	
Oliver Körner	Leibniz Institute of Vegetable and Ornamental Crops (IGZ)	

Keynote speakers

Prof. Dr. Stefania De Pascale

Professor of Horticulture, Department of Agriculture, University of Naples Federico II, Italy

Keynote speech: Greenhouse Horticulture in the Context of Circular Economy

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Prof. Dr. Ir. Eldert J. van Henten

Professor of Biosystems Engineering, Farm Technology Group, Wageningen University & Research, The Netherlands

Keynote speech: Greenhouse robotics: current status, challenges and opportunities

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Prof. Dr. Uwe Schmidt

Professor of Biosystems Engineering, Biosystems Engineering Department, Humboldt University of Berlin, Germany

Keynote speech: Speaking Plant Approach in the Artificial Intelligence (AI) Century: Outdated Concept or Future Structure for Intelligent Greenhouse Process Automation

Invited speakers

Prof. Dr. Leo Marcelis

Horticulture and Product Physiology group, Wageningen University, The Netherlands

Keynote speech: Vertical farming: beyond the hype

Prof Dr. Leo Marcelis is head of the chair group Horticulture and Product Physiology at Wageningen University, The Netherlands. This group holds a strong position in research and education on greenhouse horticulture, vertical farming and post-harvest quality.

His research focuses on sustainable production of high quality products in vertical farms and greenhouses; Leo has a strong background in plant physiology, crop monitoring, computational modelling and experimentation. He has extensively studied the physiology, growth and development of plants in order to improve sustainability and quality of crop production in greenhouses and vertical farms. In particular fluxes of assimilates, water and nutrients in the plant, sink/source interactions and partition-

ing among plant organs in response to abiotic constraints are subject of study. LED lighting is a major theme in his research. At the moment he is leading large multidisciplinary research programmes on vertical farming and greenhouse crop production in which universities and private companies cooperate.

His publications can be found here: Leo F.M. Marcelis - Google Scholar
More info: https://www.wageningenur.nl/en/Persons/Leo-Marcelis.htm

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Dr. José Ernesto Olvera González

President of Technological Institute of Pabellón of Arteaga, Aguascalientes, México

Keynote speech: LED Light Technology in Mexican Agriculture

PhD. José Ernesto Olvera González is a professor-researcher and current President of Technological Institute of Pabellón of Arteaga in Aguascalientes, México. He earned a doctorate in engineering sciences at the Autonomous University of Zacatecas and is the founder of the Artificial Lighting Laboratory (LIA) in 2016, the only laboratory in México focused on the use of artificial light with LED technology applied for the production of crops for human consumption and other applications in the agro-industrial sector such as food disinfection with UV-LED Light. Dr. Olvera has more than 21 published international scientific research and technological innovation.

Prof. Dr. In-Bok Lee

Aero-Environmental & Energy Engineering Laboratory (A3EL), Department of Rural Systems Engineering, College of Agriculture & Life Sciences, Seoul National University

Keynote speech: Diversifying the application of CFD technology on Greenhouse R&D

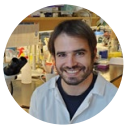
He received a PhD degree in 1998 in aerodynamics and energy in agriculture at Ohio State University, USA. The major research field of I.B. Lee is Aero-Environmental and Energy Engineering in Agriculture while his researches combine experimentation and simulation. He conducts studies on greenhouse structural design with wind loads, natural and mechanical ventilation design of greenhouses, energy saving and renewable energy of greenhouse, information and communication technology and smart farm greenhouses, virtual reality of greenhouse for education, etc. His research team, Aero-Environmental and Energy Engineering Laboratory (A3EL) is very strong for aerodynamic approaches such as Computational Fluid Dynamics, large-sized wind tunnel, particle image velocimetry, and actively develops various advanced experimental tools for field experiments. In-Bok Lee has published over 120 peer review papers and over 200 papers in professional journals.

Prof. Dr. Beatrix Alsanius

Swedish University of Agricultural Sciences, Sweden

Keynote speech: The riddle of soil biological assessments in organic greenhouse horticulture

Beatrix Waechter Alsanius is an internationally leading researcher on sustainable food production in horticultural cropping systems, emphasizing on the use of microorganisms for environmentally-sound cropping systems, threats of human and plant pathogens in horticultural production chains and food safety of vegetables and fruit. She has a Ph.D. from Bonn university (1991), Germany and combined her assistant professorship at SLU (1992-1998) with different postdoctorate leaves at INRA, France and USDA-ARS/ Washington State University, Pullman, WA, US. She was habilitated in horticulture in 1999 and in plant protection ecology in 2006 at the Swedish University of Agricultural Sciences. Since 2009 her current position is chair professor in horticulture at the Swedish University of Agricultural Sciences (SLU), Alnarp, Sweden. During 2010 to 2013 she acted also as an adjunct professor in phytology at Université Laval, Québec, Canada and headed from 2009-2014 the international postgraduate school "Microbial Horticulture (μHORT)", funded by the Swedish research council Formas. Within her position at SLU Alnarp she leads the research activities at the Microbial Horticulture Unit. Beatrix Alsanius was vice-chair of the EU-COST action "Biogreenhouses" during 2012-2016. Within the Core Organic project "GreenResilient" she lead the workpackage dealing with soil health and functional biodiversity. Beatrix Alsanius was awarded membership in the Royal Swedish Physiographic Society and the Royal Swedish Academy of Agriculture and Forestry.



Dr. Adam Barrada

Aix Marseille University, Canada

Keynote speech: Organic fertilizers: as priming agents for enhanced plant defences against pathogens?

Dr. Adam Barrada, an Agronomy engineer from the University of Lorraine (France), completed his plant biology PhD at Aix-Marseille University (France) in 2018. His research focused on the Target of Rapamycin (TOR) pathway, which regulates the balance between plant growth and stress adaptation. During his doctoral studies, Dr. Barrada made a significant discovery by identifying Yet Another Kinase 1 (YAK1) as a novel TOR target in plants, responsible for controlling cell proliferation in root meristems. Following his PhD, Dr. Barrada pursued a two-year postdoctoral position at Prof. Dominique Michaud's Laboratory at the Plant Research and Innovation Center (CRIV, Laval University). There, he collaborated with Medicago Inc. to engineer an agrobacterial strain capable of producing cytokinins. His research demonstrated the strain's ability to impact plant defense responses and increase recombinant protein yields in *Nicotiana benthamiana*. This project introduced him to the field of plant-microbe interactions, leading to his second postdoctoral position in Prof. Martine Dorais's laboratory at CRIV.

Since 2020, under Professor Dorais's guidance, Dr. Barrada has been investigating how organic farming practices affect plant physiology and stress responses. His recent focus has been on understanding how organic fertilizers can alter the rhizosphere microbiome, influencing plant defense metabolism and biotic stress resilience. Dr. Barrada employs various molecular tools in his research and is always eager to collaborate and share his expertise.

Thematic areas Greensys 2023

- Alternative energy in controlled environments
- Circular bioeconomy in controlled environments
- Climate control and modelling
- Computational Fluid Dynamics (CFD) in controlled environment horticulture
- Controlled environment horticulture to improve human nutrition
- Covering materials
- Energy in controlled environment agriculture systems
- Environmental impacts of controlled environment horticulture
- Fertigation, water management
- Greenhouse systems and design
- Greenhouse crops modelling and management
- Growing media, hydroponics, aquaponics
- Labor in greenhouses
- Lighting technology
- Plant production, protection, and quality
- Sustainable greenhouse systems and environmentally friendly technologies
- Sensors, automation, and robotics in greenhouses
- Semi-protected cultivation systems (high tunnels, shade, and screen houses)
- Vertical farming, Plant factory with artificial lighting (PFAL)
- Vulnerability and resilience of horticultural production systems

Thematic areas IV International Symposium on Organic Greenhouse Horticulture

- Biostimulants, soil, and plant microbiome
- Breeding, robust planting material and regulation
- Contentious inputs of organic farming
- Crop health – disease and pest management of organic crops
- Crop management of organic farming
- Economics, social and regulation of organic farming
- Environmental performance of organic greenhouse farming systems
- Innovative and diversified cropping farming systems
- Organic waste management
- Product quality, allergens, and contaminants
- Sustainable growing media and compost
- Sustainable irrigation management of organic cultivation
- Soil fertility and sustainable fertilization strategies
- Urban organic farming and food security

Workshops

Workshop on Computational Fluid Dynamics (CFD) in Greenhouses: Cultivating a Sustainable Future!

Modality: Presentation and discussion of practical cases and implementations
Duration: 1.5 hours
Date: October 24th, 2023
Presenter: Dr. Francisco Domingo Molina-Aiz, University of Almería, Spain

We welcome you to the Workshop on Computational Fluid Dynamics (CFD) in Greenhouses, where we will explore the possibilities of application of CFD simulations in greenhouses. The objective of this workshop is to involve a diverse audience of researchers, engineers, farmers and all attendant interested in using CFD simulations to model the interaction between crops and the microclimate inside greenhouses, visualizing the distribution of the different parameters in space and time.

The constant evolution of the world climate because of global warming has made it necessary to search for new solutions to design greenhouses and climate control systems that allow improving environmental conditions inside greenhouses. On the other hand, the increase in the prices of the inputs, the need to reduce the use of pesticides, the scarcity of water and the limitation of the use of energy make it necessary to optimize its use in greenhouses. The CFD has been shown to be a very useful tool to analyse the exchanges of matter and energy inside greenhouses and their effect on crops.

During this workshop we will analyse the immense capabilities of the CFD for the evaluation of climate control systems in greenhouses. We will also address its limitations and the need for robust model validations in order to guaranty the accuracy of its predictions.

Workshop on Machine Learning and IoT for Greenhouses: Cultivating a Sustainable Future!

Modality: Presentation and discussion of practical cases and implementations
Duration: 1.5 hours
Date: October 24th, 2023
Presenter: Dr. Alvaro Fuentes, Jeonbuk National University, South Korea

We welcome you to the Workshop on Machine Learning and IoT for Greenhouses, where we will delve into the powerful fusion of agriculture and artificial intelligence. This workshop aims to engage a diverse audience of practitioners, researchers, farmers, and all enthusiasts interested in harnessing cutting-edge AI-based technology to monitor and optimize plant growth within controlled greenhouse environments.

As the world faces pressing challenges such as climate change, resource limitations, and a growing global population, it is crucial to explore innovative and sustainable practices in agriculture. Greenhouse

farming has emerged as a beacon of hope in meeting these challenges, offering controlled environments that allow us to grow crops more efficiently, with minimal water usage and reduced reliance on pesticides. However, to truly unlock the full potential of greenhouse farming, we must harness the power of artificial intelligence.

During this workshop, we will embark on a journey to discover the immense possibilities that machine learning offers while addressing the challenges of transforming greenhouse practices. From automating monitoring and data collection processes to enabling predictive analytics for optimized crop yields, the applications of AI in agriculture are limitless.

Networking Session on Machine Learning and Data Science CIGR – Working Group 12

Modality: Dynamic Collaborative Circles
Duration: 1.5 hours
Date: October 24th, 2023
Moderation: Luis Miranda

The present workshop provides a structured platform for participants to meet and interact with multiple individuals in a short time. The focus is set on the facilitation of building professional networks of practitioners working on similar as well as complementary subjects.

The workshop underlines interaction and collaboration, combining fast networking with deeper, focused discussions in thematic groups and is organized in two phases as follows:

First phase: Speed Networking

The participants will be given the opportunity to briefly share their expertise and interests on a bilateral setting. The goal is to gain knowledge onthe common and complementary fields and interests and identify potential partners for deeper discussions.

Second phase:Unmoderated Thematic

Round Tables Thematic round tables will be freely available for joint discussions in groups. Participants are encouraged to use this setting to share their experiences, challenges, insights, and interests.

Topics: The following is a non-exhaustive list of topics of interest in the session:

- Phenotyping, 3D Models
- Energy harvesting, climate control, Irrigation
- Supply chains, logistics
- python, jupyter, R/RStudio, keras, CLI
- Image analysis, Multispectral sensors, Chlorophyll fluorescence
- openCV, Computer Vision

- Time Series Analysis and Forecasting
- Robotics, UAV
- Random Forests, Bayesian methods, Non-linear regression
- t-SNE, MonteCarlo, Evolutionary algorithms
- Deep learning, transformers
- Edge computing, Parallel computing, Scientific computing, GPUs
- IoT, Smart Sensors
- Decision Support Systems, Bots

FAO Workshop within the Framework of the of the GreenSys 2023: International Symposium on New Technologies for Sustainable Greenhouse Systems

"Sustainable Vegetable Production in Small-scale Farmer Greenhouses in Developing Countries"

Date: October 24th, 2023
Modality: Presentations and discussion of field experiences from FAO staff and international experts representing different regions
Duration: 1.5 hours
Moderator: Nazim Gruda and Melvin Medina

This workshop aims to present different field cases and engage the audience in active discussion on sustainable approaches for technological adaptation to increase the efficiency and resilience of horticultural systems for small-scale farmers. For example, how can limiting factors such as decreasing crop yields and incomes due to extreme climate events, water scarcity, land degradation, pests and diseases, limited access to technical assistance, appropriate inputs, financial resources, and lack of infrastructure and markets be overcome more affordably, closer to the economic reach of smallholders?

The workshop is of interest to a diverse audience of practitioners such as farmers and extension agents, researchers and horticulturalists, NGOs and opinion leaders, funding agencies and policymakers, to develop and implement projects, programmes, and initiatives and to create an enabling environment for the adoption of context-specific and cost-effective technologies adapted to small-scale farmers. Field experiences and innovative approaches will be openly discussed to understand how adaptation has been achieved and what challenges were overcome to ensure sustainability: income generation, environmental protection, and social equity.

Panellists representing different geographic regions, climatic conditions, and cropping systems will share experiences and knowledge on producing vegetable crops in protected cultivation. The primary objective is to improve the livelihoods of communities through sustainable agricultural practices. Moreover, the panellists will discuss scaling approaches to achieve the SDGs for better production, nutrition, livelihoods, and a healthier environment, all while minimising investments and running costs. An open discussion with the participants will follow the presentations to explore these topics further and exchange ideas.

The workshop will provide an opportunity to highlight the necessity of making research more practical, effective, inclusive, and participatory, also targeting small-scale farmers developing technologies and practices that are efficient and affordable to overcome limiting factors and achieve food security.

Program at glance

DATE	OCT 22	OCT 23					OCT 24					OCT 25					OCT 26	OCT 27
HOUR	SUNDAY	MONDAY					TUESDAY					WEDNESDAY					THURSDAY	FRIDAY
8:00		Registration 8:00-18:00					Registration 8:00-18:00					Registration 8:00-18:00					TECHNICAL TOUR	POST-CONFERENCE TOURS
8:30		Opening ceremony					(Caribe 1-6) **Keynote Speaker**					(Caribe 1-6) **Keynote Speaker**						
9:00		(Caribe 1-6) **Keynote Speaker**																
9:30							Symposium Photo / Coffee break					Coffee break						
10:00		Coffee break					(Miramar 1) **OS-9** Lighting Technology II	(Miramar 2) **OS-10** Fertigation, water and growing medium I	(Miramar 3) **OS-11** Sensors, automation, and robotics in greenhouses I	(Caribe 7-8) **OS-12** Organic Greenhouse Horticulture: Soil health and biological assessments		(Miramar 1) **OS-17** CFD Modelling	(Miramar 2) **OS-18** Fertigation, water, and growing media III	(Miramar 3) **OS-19** Plant production, protection, and quality	(Caribe 7-8) **OS-20** Organic Greenhouse Horticulture: Soil fertility and plant health		
10:20		(Miramar 1) **OS-1** Climate control and modelling I	(Miramar 2) **OS-2** Greenhouse crops modelling and management I	(Miramar 3) **OS-3** Lighting technology I	(Caribe 7-8) **OS-4** Plant factory/ Vertical farming I													
10:40																		
11:00																		
11:20																		
11:40		Coffee break					Coffee break					Coffee break						
12:00		(Miramar 1) **OS-1** Climate control and modelling I	(Miramar 2) **OS-2** Greenhouse crops modelling and management I	(Miramar 3) **OS-3** Lighting technology I	(Caribe 7-8) **OS-4** Plant factory/ Vertical farming I		(Miramar 1) **OS-9** Lighting Technology II	(Miramar 2) **OS-10** Fertigation, water and growing medium I	(Miramar 3) **OS-11** Sensors, automation, and robotics in greenhouses I	(Caribe 7-8) **OS-12** Organic Greenhouse Horticulture: Soil health and biological assessments		(Miramar 1) **OS-17** CFD Modelling	(Miramar 2) **OS-18** Fertigation, water, and growing media III	(Miramar 3) **OS-19** Plant production, protection, and quality	(Caribe 7-8) **OS-20** Organic Greenhouse Horticulture: Soil fertility and plant health		
12:20																		
12:40																		
13:00																		
13:20		Lunch					Lunch					Lunch						
15:00	REGISTRATION	(Miramar 1) **OS-5** Climate control and modelling II	(Miramar 2) **OS-6** Greenhouse crops modeling and management II	(Miramar 3) **OS-7** Covering materials	(Caribe 7-8) **OS-8** Plant factory/ Vertical farming II		(Miramar 1) **OS-13** Greenhouse systems and design	(Miramar 2) **OS-14** Fertigation, water and growing medium II	(Miramar 3) **OS-15** Sensors, automation, and robotics in greenhouses II	(Caribe 7-8) **OS-16** Organic Greenhouse Horticulture: Crop systems and management		(Miramar 1) **OS-21** Energy in greenhouses	(Miramar 2) **OS-22** Environmental impact and sustainable production	(Miramar 3) **OS-23** Lighting technology III	(Caribe 7-8) **OS-24** Greenhouse crops management		
15:20																		
15:40																		
16:00																		
16:20																		
16:40																		
17:00		Poster sesion / Coffee break					Poster sesion / Coffee break					Poster sesion / Coffee break						
18:00	Welcome reception	ISHS Business Meeting					Workshop 1	Workshop 2	Workshop 3	Workshop 4		Closing ceremony						
19:00																		
20:00												Banquet Dinner						
21:00																		
22:00																		
24:00																		

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General Information

Language: The official language for the symposium is English.

Registration, Secrétariat, Information & Tour Desk :

All participants are required to check in at the registration desk. Registered participants will receive a name badge and the symposium package, including the Scientific Program and the Book of Abstracts.

Location: Convention Center Iberostar. Iberostar Selection Cancún Hotel (México).
Address: Boulevard Kukulcán km. 17, C.P. 77500, Cancún, Qroo., México.

Registration Hours:

22 October (Sunday): 15:00–18:00
23–25 October (Monday–Wednesday): 8:00–18:00

Registration fee covers:

	General participant	Student	Attendant/ Accompanying Person
Admission to all oral and poster sessions	X	x	x
Admission to workshops	X	x	x
Welcome reception event	X	x	x
Coffee/refreshments breaks and lunch	X	x	x
Symposium package	X	x	
Online access to the electronic version of the Acta Horticulturae symposium proceedings	X		

Identification Badge:

For security purposes, participants are reminded to wear their ID badges while attending symposia and social events. Entrance into sessions will be limited to badge holders only.

Internet:

Free Internet will be available in the Convention Center, Iberostar Selection Cancún Hotel. WiFi code will be announced near the registration desk.

Certificate of participation:

All the participants requiring a certificate of participation should ask for it at the registration desk or by e-mail to greensys2023@chapingo.mx or greensys2023@gmail.com before November 30. A digital certificate (PDF) will be sent to you by email.

Presentation guidelines

Oral presentations

Authors should prepare their presentation using Microsoft PowerPoint (2016 or latest version) or Portable Document Format (PDF). The organization is not responsible for problems caused by incompatible issues with the software.

The total time allotted to each oral presentation is 20 min: 15 minutes for presentation and 5 minutes for questions. Please strictly comply with this time schedule.

Please bring your presentation file on a USB Memory stick to the preview room at least 12 hours before your scheduled presentation time. Name your presentation using your full name and put it in the folder with the same name as your session name (e.g. OS12-03). Only one file by folder.

Location: preview room is Mezanine Convention Center Iberostar Peninsula.

Open Hours: 22 October (Sunday): 15:00-19:00
23 October (Monday): 8:00-18:00
24 October (Tuesday): 8:00-18:00
25 October (Wednesday): 8:00-15:00

Please ensure you reach your session room at least 15 minutes before the start of oral presentations to check if anything changes and discuss it with the session chair. We also recommend you bring your presentation file with you on a USB memory stick or save a copy of your presentation electronically on an accessible internet site.

Note: If you do not check your presentation into the preview room, you will be responsible for time lost to upload your presentation onto the computer in the session room.

Posters presentations

The following guidelines are provided to prepare posters:

a) Poster dimensions should be less than 91.4 cm (36 inches) in width and 121.9 cm (48 inches) in height.
b) In the upper part must be placed the Symposium logo, the title of the communication, author's names, and affiliation.
c) All text and characters should have a size that allows reading from a distance not exceeding 2 meters.
d) The Organizing Committee will provide placards to display the posters that will be affixed to the panels using poster glue available on the poster exhibition area.
e) Posters should be installed in the morning (from 8:00, or on Sunday afternoon for the Monday session) of the presentation and retrieved in the evening of the same day (before 18:30).

Posters will be displayed all day long. During the time schedule dedicated to poster presentations (see hereafter), authors are encouraged to stay next to their poster to answer questions.

Poster presentations (Isla room)

23 October (Monday), 17:00–18:00 (PS01)
24 October (Tuesday), 17:00–18:00 (PS02)
25 October (Wednesday), 17:00–18:00 (PS03)

Official/Social program

Welcome Reception:

All registered participants and accompanying persons are invited to attend the Welcome Reception. Food and drinks will be served.

Location: Miramar Garden at Iberostar Convention Center. Iberostar Selection Cancún Hotel.
Date & Time: 22 October (Sunday) 18:00–21:00

Opening Ceremony:

All registered participants are invited to attend the Opening Ceremony.

Location: Caribe Hall room 1-6 at Iberostar Convention Center. Iberostar Selection Cancún Hotel.
Date & Time: 23 October (Monday) 8:30–9:00

Closing Ceremony:

All registered participants are invited to attend the Closing Ceremony.

Location: Miramar Hall room at Iberostar Convention Center. Iberostar Selection Cancún Hotel.
Date & Time: 25 October (Wednesday) 18:00–18:30

Banquet Dinner:

Location: Caribe Hall room 1-6 at Iberostar Convention Center. Iberostar Selection Cancún Hotel.
Date & Time: 25 October (Wednesday) 20:00–24:00

Lunches:

Lunch will be provided for three days.

Location: Caribe Hall room 1-6 at Iberostar Convention Center. Iberostar Selection Cancún Hotel.
Date & Time: 23, 24 & 25 October 13:20–15:00

Coffee Breaks:

Coffee and tea will be served to all participants.

Location: Foyer Caribe & Foyer Miramar
Date & Time: 23 October (Monday) 10:00–12:20, 11:40–12:00, 17:00–18:00 with poster presentation.
24 October (Tuesday) 9:30–10:00 with group photo, 11:40–12:00, 17:00–18:00 with poster presentation.
25 October (Wednesday) 9:30–10:00, 11:40–12:00, 17:00–18:00 with poster presentation.

Group Photo:

A commemorative group photo will take place.

Location: Miramar Garden at Iberostar Convention Center. Iberostar Selection Cancún Hotel.
Date & Time: 24 October (Tuesday) 9:30–10:00

Technical Tour

The participants who wish to join the technical tour should confirm their attendance at the registration desk before midday on 23rd October. For late registration, please note that it will be subject to availability. Upon confirming your attendance at the desk, you will get detailed information about the tour.

Date & Time: 26 October 7:30–20:00

We draw the attention of participants to the fact that due to the busy time schedule and possible traffic jams, the return to the Cancún Hotel Area may be delayed. Also, because of time-zone differences, the arrival time at the Cáncun Hotel Zone will be around 21:00 pm.

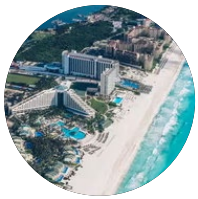
Tour fee: 120 USD.

Conditions: All admission fees, transportation, and lunch are included.

Itinerary:

7:30 Departure from the Iberostar Selection Cancún Hotel.
9:30–11:30 Visit to PAMASUR Company located at Temozon, Yucatán.
12:00 –14:00 Visit to Cenote Hubiku (including lunch).
14:00 Departure to Chichén Itzá Archeological site.
15:00–17:00 Visit to Chichén Itzá Archeological site.
17:00 Travel to Cancún Hotel zone.

Location



Convention Center Iberostar.
Iberostar Selection Cancún Hotel (México).

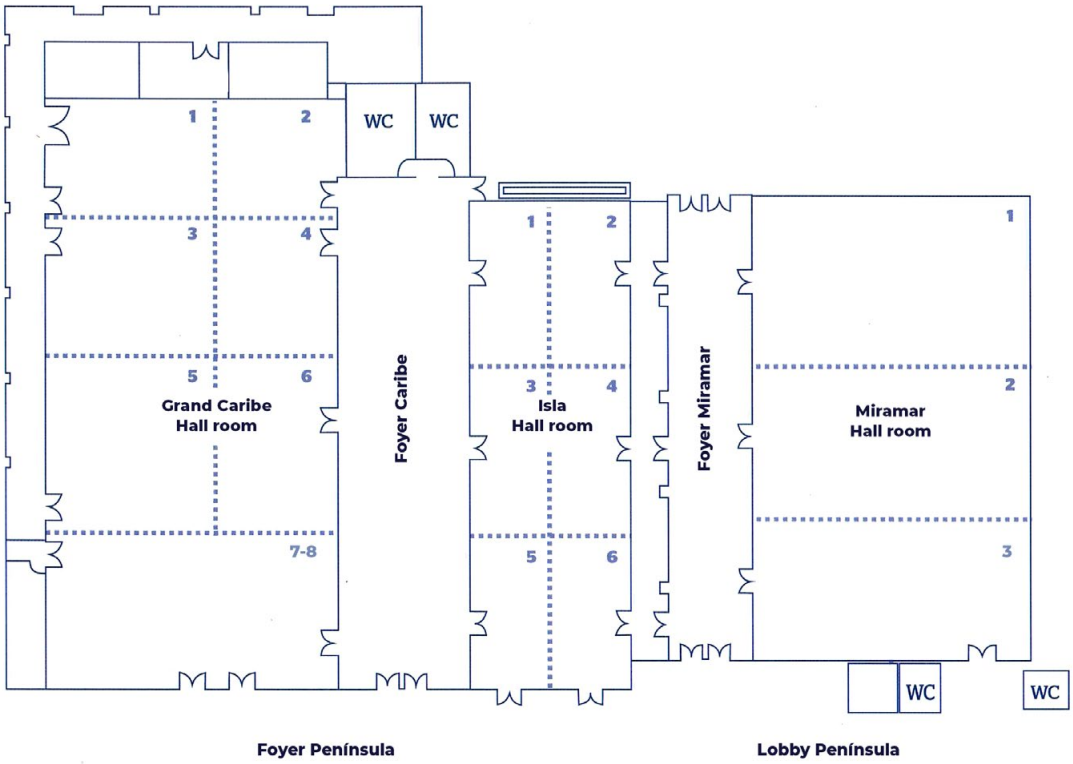
Address: Boulevard Kukulcán km. 17, C.P. 77500, Cancún, Qroo., México.

Google Maps location: https://maps.app.goo.gl/MKZGtSYL3CNwubQWA

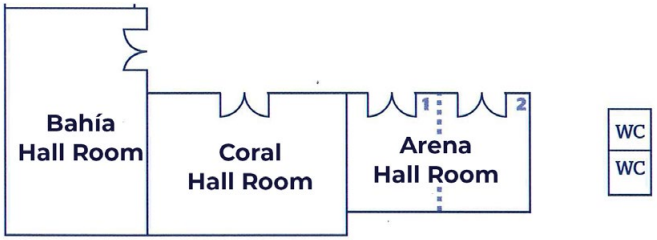
General Map / Iberostar Selection Cancún Hotel (México)

- Recepción / Front desk
- Star Market Tienda (Nivel 1) / Star Market Shop (Level 1)
- 1 Palapa de Aerobics y Ping Pong / Aerobics & Ping Pong Palapa
- 2 Kids Club
- 3 Teenie Club Star Friends
- 1 Restaurante Steakhouse "La Parrilla" / (Nivel de Mezzanini / Level Mezzanini)
- 2 Restaurante Japonés "Naga Hibachi" / (Nivel de Mezzanini / Level Mezzanini)
- 3 Restaurante Gourmet "La Horma" / (Nivel 1 / Level 1)
- 4 Restaurante "El Antiguo Laguito" / (Nivel 1 / Level 1)
- 5 Restaurante de Playa y Mexicano "Maguey" / Beach & Mexican Restaurant "Maguey"
- Canchas de deporte / Sports Courts
- 1 Lobby Bar "Las Palmas" (Nivel 1 / Level 1)
- 2 Sports Bar "Vértigo" / (Nivel Mezzanini / Mezzanini Level)
- 3 Bar Piscina "Carey" / Pool Bar "Carey"
- 4 Aqua Bar "La Perla"
- 5 Bar de Playa "Las Olas" / Beach Bar "Las Olas"
- Gimnasio (Nivel Mezzanini) / Fitness Center (Level Mezzanini)
- Centro de Negocios (Nivel 1) / Bussines Center (Level 1)
- Internet
- 1 Star Friends Club House
- 2 Star Friends Club House Toallas / Towels
- Centro de Convenciones / Convention Center
- 1 Salón "Miramar" (Planta Baja) / (Ground Floor)
- 2 Salón "Isla" (Planta Baja) / (Ground Floor)
- 3 Gran "Caribe" (Planta Baja) / (Ground Floor)
- 4 Jardín "Miramar" (Planta Baja) / (Ground Floor)
- 5 Salón de Reunión (Nivel Mezzanini) / (Bahía / Coral / Arena) (Level Mezzanini)
- 6 Playa de Grupos / Group's Beach
- 7 Lobby Centro de Convenciones Lobby Convention Center
- Jacuzzi
- Parque Acuático / Aquatic Park
- Gazebo de Bodas / Wedding Gazebo
- Cancha de Football / Soccer Field
- Teatro & Bar "El Telón" / Theatre & Bar "El Telón"
- Cohiba Atmosphere Bar de Fumadores (Nivel 1) / Cigar Bar (Level 1)
- Golf Club House
- 1 SPA Sensations / (Sótano / Basement)
- 2 Palapas de Masajes / Massage Palapa
- 3 Palapas de Masajes / Massage Palapa

Floor plan / Convention Center Iberostar



Mezanine Level



GreenSys 2023

International Symposium on New Technologies for Sustainable Greenhouse Systems

Scientific program

Monday October 23, 2023

8:00	Registration 8:00-18:00			
8:30	Opening ceremony 8:30-9:00			
9:00	Keynote speaker 9:00-10:00 Speaker: U. Schmidt Chair: I. L. Lopez-Cruz			
10:00	Coffee break 10:00-10:20			
10:20	Oral session 10:20-11.40			
	OS-1	**OS-2**	**OS-3**	**OS-4**
	Climate control and modelling I Chair: G. Giacomelli OS01-01: H. Choi OS01-02: S. van Mourik OS01-03: D. Kim OS01-04: P. de Heer	**Greenhouse crops modelling and management I** Chair: L. Miranda-Trujillo OS02-01: D. Savvas OS02-02: M. Verheul OS02-03: K. Jinhyun OS02-04: T. Ishii	**Lighting technology I** Chair: X. Hao OS03-01: B. Alsanius OS03-02: S. Chen OS03-03: J. Yu OS03-04: J. Yun	**Plant factory/Vertical farming I** Chair: F. Orsini OS04-01: L. Marcelis (Invited) OS04-02: E. Goto OS04-03: J. Hu
11:40	Coffee break 11:40-12:00			
12:00	Oral session 12:00-13:20			
	OS-1	**OS-2**	**OS-3**	**OS-4**
	OS01-05: E. Chantoiseau OS01-06: F. de Zwart OS01-07: H. Suh OS01-08: E. Fitz-Rodríguez	OS02-05: N. Fujiuchi OS02-06: Y. Iwasaki OS02-07: S. Yoon OS02-08: N. Vilfan	OS03-05: M. Han OS03-06: S. Nam OS03-07: T. Joilek OS03-08: M. Hellström	OS04-04: J. Kim OS04-05: F. Wang OS04-06: T. Jishi OS04-07: Y. Tong
13:20	Lunch (13:20-15:00)			
15:00	Oral session 15:00-17:00			
	OS-5	**OS-6**	**OS-7**	**OS-8**
	Climate control and modelling II Chair: H. Fatnassi OS05-01: E. Janssen OS05-02: J. Valencia-Islas OS05-03: R. Vanbeylen OS05-04: N. Katsoulas OS05-05: K. Weerheim OS05-06: J. Wang	**Greenhouse crops modeling and management II** Chair: A. Ramirez-Arias OS06-01: M. Gallardo OS06-02: H. Suh OS06-03: Y. Zheng OS06-04: F. Molina Aiz OS06-05: C. Collado OS06-06: S. Lee	**Covering materials** Chair: J. Flores-Velázquez OS07-01: P. E. Bournet OS07-02: M. Bergren OS07-03: H. Vitoshkin OS07-04: P. Persons OS07-05: J. Sánchez-Molina OS07-06: H. Seo	**Plant factory/Vertical farming II** Chair: E. Goto OS08-01: Ch. Vatistas OS08-02: G. Pennisi OS08-03: D. Nunez OS08-04: D. Tran OS08-05: C. Carpineti OS08-06: Y. Ji OS08-07: I. Righini
17:00	Poster session with coffee break 17:00-18:00			
18:00	ISHS Business meeting			

Oral presentations: Monday October 23, 2023

9:00–10:00 KEYNOTE LECTURE 1
Chair: I.L. López-Cruz

Speaking Plant Approach in the Artificial Intelligence (AI) Century: Outdated Concept or Future Structure for Intelligent Greenhouse Process Automation

U. Schmidt
Humboldt University Berlin, Germany

10:20–11:40 ORAL SESSION 1 / Climate control and modelling I
Chair: G. Giacomelli

OS01-01

Exploring NeRF for Automated 3D Phenotyping in Greenhouse: A Promising Direction in Shape Measurement and Analysis

HongBeom Choi, HyeIn Lee, HyukJae Lee, Dr. Soo Hyun Park, Dr. Taek-Sung Lee
Korea Institute of Science and Technology, Korea (Republic of)

OS01-02

Plant Performance in Precision Horticulture: Visualizing optimal control strategy under stochastic uncertainty

S. van Mourik[1], M. Vellekoop[2]
[1]Farm Technology group, Wageningen University & Research, Netherlands
[2]University of Amsterdam, Netherlands

OS01-03

Time series forecasting for air temperature inside a naturally ventilated greenhouse with optimal sensor location based on LSTM

Da In Kim, In-bok Lee, Jeong-hwa Cho, Young-bae Choi, Hyo-hyeog Jeong, Sol-moe Kang, Seo-ha Park
Seoul National University, Korea (Republic of)

OS01-04

Predicting greenhouse design performance and suggested improvements using massive cloud-simulation and machine learning

Paolo de Heer, Anouk Beelen, Athanasios Sapounas, Richard Dekker
TNO, Netherlands

12:00–13:20 ORAL SESSION 1 / Climate control and modelling I

OS01-05

Computing radiative heat transfers in greenhouses: a methodology coupling analytical and numerical approaches for view factors assessment

Samuel Sourisseau[2], Etienne Chantoiseau[1], Cyril Toublanc[1], Michel Havet[1]
[1]Institut Agro Rennes-Angers, France
[2]Oniris, Nantes Université, France

OS01-06

An on-line benchmark tool for greenhouse technology towards fossil-free greenhouses

Feije De Zwart, Gert-Jan Swinkels, Luuk Graamans, Silke Hemming, David Katzin, Kshiti Mishra
Wageningen UR Greenhouse Horticulture, Netherlands

OS01-07

Assessing Tree-Based Boosting Algorithms for Crop Growth Forecasting in Greenhouse Cultivation

Hyun Kwon Suh[1], Ju Yeon Ahn[1], Hyeonji Park[1], Soo Hyun Park[2], Joon Yong Kim[3]
[1]Sejong University, Korea (Republic of)
[2]Smart farm research center, Korea Institute of Science and Technology, Korea (Republic of)
[3]Dept. of Biosystems and Biomaterials eng., Research Institute of Agriculture, Seoul National University, Korea (Republic of)

OS01-08

High-pressure fogging system for VPDc control in low-tech greenhouse crops

Efrén Fitz-Rodríguez, José Orbelin Gutierrez-Hernández, José Armando Ramírez-rias, Irineo L. López-Cruz, Agustín Ruíz-García
Universidad Autónoma Chapingo, México

10:20–11:40 ORAL SESSION 2 / Greenhouse crops modelling and management I

Chair: L. Miranda-Trujillo

OS02-01

Model-based optimization of nutrient supply in a lettuce crop grown in recirculating nutrient solution using the Decision Support System NUTRISENSE

Dimitrios Savvas, Evangelos Giannothanasis, Lena Voulgari, Georgia Ntatsi
Agricultural University of Athens, Greece

OS02-02

Optimisation of tomato production in a closed greenhouse system in Norway

Michel Verheul
Norwegian Institute of Bioeconomy Research, Norway

OS02-03

Paprika Growth Modeling Using Cropbox

Kim Jinhyun, Min ju Shin, Ji Woong Bang, Ho Jeong Jeong, Seung Ri Yoon
National Institute of Horticultural and Herbal Science, Korea

OS02-04

Maintaining the quality of strawberry fruit in long-term storage by keeping the environment at low temperature and high humidity

Takashi Ishii, Tomohiro Jishi, Kazuhiro Shoji
Central Research Institute of Electric, Power, Graduate School of Horticulture, Japan

12:00–13:20 ORAL SESSION 2 / Greenhouse crops modeling and management modelling I

OS02-05

Process-based crop model to evaluate stress on tomato plants and predict the fruit yield and quality

Naomichi Fujiuchi[1], Hiroko Yamaura[2], Risa Suenaga[2], Naho Takebuchi[2], Misa Kikuchi[3], Hiroaki Saito[3], Garima Singh[3], Yuta Takahashi[3], Hiroshi Ezura[2], Naoya Fukuda[2]
[1]Ehime University, Japan
[2]University of Tsukuba, Japan
[3]Toyo Holdings, Co., Ltd, Japan

OS02-06

The "N-C balance model" for optimizing nitrogen supply and temperature management in greenhouse fruit vegetable production

Yasunaga Iwasaki
Meiji University, Faculty of Agriculture, Japan

OS02-07

Utilizing Decision Tree Algorithm for Melon Fruit Weight Prediction

Seungri Yoon[1], Taewon Moon[2], Jin Hyun Kim[1], Minju Shin[1], Ji Wong Bang[1], Ho Jeong Jeong[1], Tae In Ahn[2]
[1]National Institute of Horticultural and Herbal Science
[2]Seoul National University

OS02-08

Virtual Tomato Crops: a digital twin of a tomato crop

Nastassia Vilfan, Katarina Smolenova, Pieter De Visser, Jochem Evers
Wageningen University and Research, Netherlands

10:20–11:40 ORAL SESSION 3 / Lighting technology I

Chair: X. Hao

OS03-01

Integrated production in new light: light quality in greenhouse horticulture and its impact on the phyllosphere microbiome

Beatrix Waechter Alsanius, Maria Hellström, Karl-Johan Bergstrand, Anna Karin Rosberg, Maria Karlsson
Dept. of Biosystems and Technology, SLU, Microbial Horticulture Unit, Sweden

OS03-02

Effect of supplementary far-red light on plant growth, fruit set, yield and fruit quality of sweet pepper

Sijia Chen[1], Leo Marcelis[1], Remko Offringa[2], Theoharis Ouzounis[3], Ep Heuvelink[1]
[1]Wageningen University and Research, Netherlands
[2]Plant Developmental Genetics, University Leiden, Netherlands
[3]Fluence, Netherlands

OS03-03

Effect of Different Supplemental Lighting Sources on Cucumber (*Cucumis sativus* L.) Growth

Jin Yu, Eun Won Park, Ji Hye Yun, Hyeong Eun Choi, So Yeong Hwang, Jeong Hun Hwang, Hee Sung Hwang, Seung Jae Hwang
Gyeongsang National University, Korea (Republic of)

OS03-04

Intumescence Incidence of 'Sinhong' Hot Pepper Seedlings under Different Light Qualities

Ji Hye Yun, Jin Yu, So Yeong Hwang, Eun Won Park, Jeong Hun Hwang, Hyeong Eun Choi, Hee Sung Hwang, Seung Jae Hwang
Gyeongsang National University, Korea (Republic of)

12:00–13:20 ORAL SESSION 3 / Lighting technology I

OS03-05

Growth, morphology, and light acclimation of cucumber seedlings grown under different light spectral qualities

Minhee Han, Jiwoong Bang, Jungseop Lee, Chul Geon Ahn, Jaehan Lee, Jin Hyun Kim, Dongpil Kim
Protected Horticulture Research Institute, Korea (Republic of)

OS03-06

A chlorophyll fluorescence-based biofeedback system to optimize LED lighting: from seedling to harvest stage

Suyun Nam, Marc W. van Iersel, Rhuanito S. Ferrarezi
University of Georgia, United States of America

OS03-07

Growth comparison of corn salad and frill lettuce under the same environmental conditions with artificial light

Teeranuch Joilek[1], Maitree Munyanont[1], Thanit Ruangsangaram[2], Dannisa Fathiya Rachma[1], Tomoka Endo[1], Na Lu[1], Michiko Takagaki[1]
[1]Chiba university, Japan
[2]Kasetsart University, Thailand

OS03-08

Utilizing light exposure to its fullest: how light quality can aid biocontrol introduction in greenhouse horticulture

Maria Hellström, Maria Karlsson, Ramesh Raju Vetukuri, Paul G. Becher, Beatrix W. Alsanius
Swedish University of Agricultural Sciences, Sweden

10:20–11:40 ORAL SESSION 4 / Plant factory and vertical farming I

Chair: F. Orsini

OS04-01

Vertical farming: beyond the hype

Leo Marcelis
Horticulture and Product Physiology group, Wageningen University, The Netherlands

OS04-02

Development of a novel crop cultivation system with environmental and crop monitoring functions for a lunar-base plant factory

Eiji Goto, Hideo Yoshida, Kota Saito, Moe Sekiya, Taishi Okabe, Xinglin Ke, Shoko Hikosaka
Chiba University, Japan

OS04-03

Research and application of plant factory technology on precise control of selenium in vegetables

Jiangtao Hu[1], Zheng Wang[1], Li Zhang[1], Jie Peng[1], Tao Huang[1], Xiao Yang[1], Byoung Ryong Jeong[2], Qichang Yang[1]
[1]The Graduate School of Chinese Academy of Agricultural Sciences, China
[2]Gyeongsang National University GNU, Korea (Republic of)

12:00–13:20 ORAL SESSION 4 / Plant factory and vertical farming I

OS04-04

Analysis on the air-conditioning system to enhance the uniformity in a multi-layer vertical farm under tropical climate condition

Jaehyun Kim, Sang Min Lee, Eunjung Choi
Korea Institute of Machinery Materials, Korea (Republic of)

OS04-05

Effects of LED Red and Blue Light Component on Growth and Photosynthetic Characteristics of Coriander in Plant Factory

Fang Wang[1], Qi Gao, Qiuhong Liao[1], Qingming Li[1], Jianming Li[2], Qichang Yang[1]
[1]The Graduate School of Chinese Academy of Agricultural Sciences, China
[2]Northwest A&F University, China

OS04-06

Adjustment of equipment operation in a plant factory under solar power generation

Tomohiro Jishi[1], Kazuhiro Shoji[1], Takashi Ishii[1], Shigeru Bando[1], Norihiko Itoh[1], Fumiyuki Goto[2], Naoto Higa[3], Syougo Kinjyou[4]
[1] Central Research Institute of Electric Power Industry, Japan
[2] Saga University, Japan
[3]Nextems Co., Ltd. Nextems, Japan
[4]Okinawa Electric Power Company, Japan

OS04-07

Lettuce plant morphology and nutrient solution physiochemical properties in response to the recycled nutrient solution in a plant factory with artificial light

Yuxin Tong
Chinese Academy of Agricultural Science, China

15:00–17:00 ORAL SESSION 5 / Climate control and modeling II

Chair: H. Fatnassi

OS05-01

Dimensioning the reverse osmosis desalination system for a tomato greenhouse using the SIOM simulation software

Egon Janssen, Athanasios Sapounas, Richard Dekker, Robert Bezemer
TNO, Netherlands

OS05-02

Towards a modeling and control approach based on the drying product in greenhouses

Jose Olaf Valencia Islas[1], Murat Kacira[1], Irineo Lorenzo López Cruz[2], Gene Giacomelli[1], Agustín Ruiz García[2], Peiwen Li[1]
[1]The University of Arizona, United States of America
[2]Universidad Autónoma Chapingo, México

OS05-03

Combining plant sensor measurements and decision tree analysis to better understand the 'plant stress-reducing ventilation' strategy in greenhouses

Rune Vanbeylen[1], Fjo De Ridder[2], Herman Marien[2], Griet Janssen[2], Kathy Steppe[1]
[1]Ghent University, Belgium
[2]Thomas More is the largest University of Applied Sciences, Belgium

OS05-04

Effect of shading in evaporatively cooled greenhouses in the Mediterranean region

Nikolaos Katsoulas[1], Sofia Faliagka[1], Athanasios Sapounas[2]
[1]University of Thessaly, Greece
[2]TNO, Netherlands

OS05-05

Light fluctuations affect morphological and physiological processes and biomass in tomato

Anja Dieleman
Wageningen University & Research, Netherlands

OS05-06

Application of solar water circulation heating system in Chinese solar greenhouse

Jian Wang, Mei Qu, Shumei Zhao, Jieyu Cheng, Pingzhi Wang, Chengwei Ma
China Agricultural University, China

15:00–17:00 ORAL SESSION 6 / Greenhouse crops modeling and management modelling II

Chair: A. Ramirez-Arias

OS06-01

Evaluation of the VegSyst-DSS for the management of nutrients in fertigation of a soil-grown tomato crop in Mediterranean greenhouses

Marisa Gallardo, Maria Teresa Peña-Fleitas, Francisco Manue Padilla, Rodney B. Thompson
Universidad de Almería, Spain

OS06-02

Exploring the Potential of YOLOv8 for Real-time Strawberry Flower Detection in Greenhouses

Hyun Kwon Suh, Hyeonji Park, Ju Yeon Ahn, Doyeon Kim, Yoel Kim
Sejong University, Korea (Republic of)

OS06-03

Controlled Environment Cannabis Cultivation: Current Status, Challenges and Future Trends

Youbin Zheng
University of Guelph-SES, Canada

OS06-04

Use of marble gravel mulching for tomato production inside a Mediterranean naturally ventilated solar greenhouse

Francisco Domingo Molina Aiz, M.N. Honoré, P. Marin-Membrive, D.L. Valera
University of Almería, Spain

OS06-05

Effects of Rooting Hormone, Light, and Carbone Dioxide Enrichment on the Rooting of Cannabis sativa Cuttings

Cristian Collado, Ricardo Hernandez
North Carolina State University, United States of America

OS06-06

Fine dust reduction system in agricultural facilities for worker's respiratory safety

Seong-won Lee, Il-Hwan Seo, Hyo-Jae Seo
Jeonbuk National University, Korea (Republic of)

15:00–17:00 ORAL SESSION 7 / Covering materials

Chair: J. Flores-Velázquez

OS07-01

Impact of Insect Proof Nets on the Microclimate and on the Risks of Fungal Development inside a Greenhouse Crop

Rania Missaoui[1], Pierre-Emmanuel Bournet[1], Etienne Chantoiseau[1], David Vuillermet[2]
[1]Institut Agro Rennes Angers, France
[2]RATHO, ASTREDHOR, France

OS207-02

Solar spectrum modification by luminescent agriculture films for enhanced light use efficiency in greenhouse plant trials

Matthew Bergren[1], Morgan Mattingly[2], Charles Parrish[1], Michael Blum[2], Damon Hebert[1], Gene Giacomelli[2]
[1]UbiQD, United States of America
[2]University of Arizona, United States of America

OS07-03

Implementing of Semi-transparent Organic Photovoltaic Modules in a Tomato Greenhouse

Helena Vitoshkin[1], Meir Teitel[1], Roei Grimberg[1], Shay Ozer[1], Ibrahim Yehia[2], Esther Magadley[2], Avi Levy[3], Asher Levi[1], Shelly Gantz[4], Roni Amir[4], Farhad Geoola[1]
[1]ARO, Volcani Center, Israel
[2]Triangle Research and Development Center, Israel
[3]Department of Mechanical Engineering, Ben-Gurion University of the Negev, Israel
[4]Agricultural Extension Service, MOA, Israel

OS07-04

Lettuce Photosynthesis and Light Response Curves under Semi-transparent Solar Cells

Parker Persons, Rhuanito Ferrarezi, Marc van Lersel
University of Georgia, United States of America

OS07-05

Economic analysis of a photovoltaic field on a greenhouse roof

Jorge Antonio Sánchez Molina, Jerónimo Ramos, Francisco García Mañas, Manuel Berenguel, Jorge Antonio Molina
University of Almería Almería, Spain

OS07-06

Analysis on Insulation Effects of Wind Environment and Cover Materials for Greenhouse Energy Design in Reclaimed Land

Hyo Jae Seo, Il-Hwan Seo, Hak-Sung Le
Jeonbuk National University, Korea (Republic of)

15:00–17:00 ORAL SESSION 8 / Plant factory and vertical farming II

Chair: E. Goto

OS08-01

Effect of different lighting under various wavelengths on seed germination inside a vertical farming system

Christos Vatistas, Dr. Dafni Avgoustaki, Thomas Bartzanas
Agricultural University of Athens, Greece

OS08-02

Water Use Efficiency in a Vertical Farm with Artificial Lighting: first results from AlmaVFarm

Laura Carotti, Ilaria Zauli, Alessandro Pistillo, Giuseppina Pennisi, Giorgio Gianquinto, Francesco Orsini
University of Bologna, Italy

OS08-03

Lettuce growth and light use efficiency under non conventional diel cycles and noctoperiods

Diego Nunez, Tessa Haanskorf, Leo Marcelis, Ep Heuvelink
Wageningen University and Research, Netherlands

OS08-04

Agronomical comparison of hydroponically grown sweet basil cultivars for vertical farming

Daniel Tran, Gil Caron, Marilou Maret, Robert Farinet, Bastien Christ, Cédric Camps
Agroscope Research Centre, Switzerland

OS08-05

The added value of indoor products: the strawberry case

Caterina Carpineti[1], Lucia Vanacore[2], Esther Meinen[1], Jan Janse[1], Eva Ketel[1], Ada Leman[1], Tommaso Barbagli[1], Mark van Hoogdalem[1]
[1]Wageningen University and Research, Netherlands
[2]The University of Naples Federico II, Italy

OS08-06

Faster than fast: accelerating flowering for the speed breeding of lettuce (*Lactuca sativa*) with far-red radiation

Yongran Ji, Ilse Biemond, Kai Cao, Ep Heuvelink, Leo F. M. Marcelis
Wageningen University and Research, Netherlands

OS08-07

Performances of fruit-bearing crops in indoor farming: the case of dwarf tomato

Isabella Righini, Cecilia Stanghellini, Silke Hemming, Luuk Graamans, Leo Marcelis
Wageningen University Research, Netherlands

PS01: Poster presentations: Monday October 23, 2023

PS01-01 [Lighting technology]

Indoor growing of tomato with LED lamps and FR bulbs

Marco A. Bustamante[1], Alejandro Jose Bustamante Davila[2]
[1]Universidad Autonoma Agraria Antonio Narro, México
[2] Wageningen University & Research, Netherlands

PS01-02 [Greenhouse crops modelling and management]

Estimation of a thermal time in individual cucumber (*Cucumis sativus* L.) fruit under Japanese greenhouse production

Kazuya Maeda, Dong-Hyuk Ahn
National Agriculture and Food Research Organization, Japan

PS01-03 [Lighting technology]

Growth and Flowering Characteristics of Strawberry Affected by Application of Various Light Quality

Seung Jae Hwang, Jin Yu, Ji Hye Yun, So Yeong Hwang, Eun Won Park, Jeong Hun Hwang, Hyeong Eun Choi, Hee Sung Hwang
Gyeongsang National University, Korea (Republic of)

PS01-04 [Climate control and modelling]

Air quality monitoring system in agricultural areas to identify the generation characteristics

Byungwook Oh, Il-Hwan Seo, Jin-Ho Kim
Jeonbuk National University, Korea (Republic of)
National Academy of Agricultural Science, Korea (Republic of)

PS01-05 [Plant factory with artificial lighting]

Searching for environmental conditions that increase vindoline and catharanthine concentrations in *Catharanthus roseus* leaves during early nutritional growth

Shun Ishizu[1], Ryouhei Shimizu, Keiko Ohashi-Kaneko, Masahito Takeyama[2], Shunsuke Sakaguchi, Kosuke Yamada
[1]Tamagawa Academy & University, Japan
[2] Plantx Corp., Japan

PS01-06 [Lighting technology]

Growth and flower characteristics of calendula under different light spectra in a controlled environment

Maitree Munyanont, Na Lu, Teeranuch Joilek, Dannisa Fathiya Rachma, Michiko Takagaki
Chiba University, Japan

PS01-07 [Plant factory with artificial lighting]

Optimal Irrigation Prediction Model for Advanced Wild Ginseng in Smart Farm for Sustainability based on Deep Learning Technology with Xgboost

Solhee Kim, Kyo Suh, Taegon Kim
Seoul National University, Korea (Republic of)

PS01-08 [Plant factory with artificial lighting]

Effect of plant density and light intensity on growth and yield of green perilla in plant factory with artificial lighting

Thanit Ruangsangaram[1], Maitree Munyanont[2], Jose Gabriel Corno[3], Teeranuch Joilek[2], Tomoka Endoh[2], Dannisa Fathiya Rachma[2], Na Lu[2], Michiko Takagaki[2]
[1] Kasetsart University, Thailand
[2] Chiba University, Japan
[3] Technological University of Panama, Panama

PS01-09 [Plant factory with artificial lighting]

Effect of light quality environment on nutrient uptake in several plant species grown in plant factories with artificial lighting

Keiko Ohashi, Kazuki Serizawa
Tamagawa University, Japan

PS01-10 [Plant factory with artificial lighting]

Yield and quality of cherry tomato at different harvest timing determined by cumulative temperature in plant factory

Dannisa Fathia Rachma, Na Lu, Maitree Munyanont, Teeranuch Joilek, Tomoka Endoh, Thanit Ruangsangaram, Michiko Takagaki
Chiba University, Japan

PS01-11 [Plant factory with artificial lighting]

A new technique of LED light irradiation for green leek production in plant factory

Yukiko Tomari[1], Gauri Maharjan[2], Hiroyuki Watanabe[1]
[1]Tamagawa Academy & University, Japan
[2]Signify, Japan

PS01-12 [Lighting technology]

Agronomically & Economically profitability of a shifted-tomato-cultivation in greenhouse under a Semi-Continental with Meridional Influence Climate

Dunkel Theresa, Robert Farinet, Cédric Camps, Daniel Tran
Agroscope Research Centre, Switzerland

PS01-13 [Vertical farming]

The impact of sequential harvesting and irradiation methods on tuber yield in long-day conditions using temporary light interruption treatment in potato

Ryuji Hayashi, Hiroyuki Watanabe,
Tamagawa Academy & University, Japan

PS01-14 [Plant factory with artificial lighting]

The cultivation technology for high quality spinach by controlling light environment in plant factory

Ryuji Hayashi, Hiroyuki Watanabe
Tamagawa Academy & University, Japan

PS01–15 [Greenhouse crops modelling and management]

Predicting Stomatal Conductance in Controlled Environment Through Non-Parametric Machine Learning

Darren Drewry, Srishti Gaur
The Ohio State University, United States of America

PS01–16 [Greenhouse crops modelling and management]

Dynamic analysis of leaf and air temperatures in a greenhouse canopy: which measurement to use for greenhouse climate control?

Vincent Stauffer[1], David Vuillermet[2], Etienne Chantoiseau[3], Claire Ducourouble[4], Pierre-Emmanuel Bournet[3]
[1]SAVOIE TECHNOLAC, France;
[2] RATHO, ASTREDHOR, France;
[3]L'Institut Agro, France
[4] SERAIL, France

PS01–17 [Vertical farming]

Conditions and Directions to Distribute the Rooftop Greenhouse in Korea

Eunseok Lee, Sunjoon Kim, Kyounghun Min, Jisoo Ahn, Seokhwan Ji
Architecture Urban Research Institute, Korea (Republic of)

PS01–18 [Greenhouse crops modelling and management]

Deep learning-based phenotyping data fusion approach for effective detection of drought stress responses in basil

Yu Jin Jeon[1], Ye Jin Kim[1], Taek Sung Lee[2], Hyoung Seok Kim[2], Dae-Hyun Jung[1]
[1]Kyung Hee University, Korea (Republic of)
[2]KIST Korea Institute of Science and Technology, Korea (Republic of)

PS01–19 [Greenhouse crops modelling and management]

Profiling of individual desulfo-glucosinolates and sugar content among cabbage germplasm and selection of multi-functional genotypes for commercial breedin

Yu Kyeong Shin[1], Solly Kang[1], Young Eun Jeon[1], Chang Sun Choi[1], Seong-Hoon Kim[2], Hae Ju Kang[2], Jun Gu Lee[1]
[1]Jeonbuk National University, Korea (Republic of)
[2]National Institute of Agricultural Sciences, Korea (Republic of)

PS01–20 [Vertical farming]

Evaluation of energy and light use efficiency in Valerianella locusta growing in indoor vertical farms

Dafni Avgoustaki, Christos Vatistas, Thomas Bartzanas
Agricultural University of Athens, Greece

PS01-21 [Climate control and modelling]

Physiological Disorder Analysis of Strawberry Leaves using Hyperspectral Imaging and Deep Learning Algorithm

Myongkyoon Yang
Jeonbuk National University, Korea (Republic of)

PS01-22 [Vertical farming]

Changes in the growth and isoflavone content of soybean plants according to the R/FR ratio

Ye Lin Kim, Han-Sol Sim, Ki-Ho Son
Gyeongsang National University, Korea (Republic of)

PS01-23 [Vertical farming]

Enhancement of isoflavone contents in soybean plants by pre-harvest UV-B irradiation

Han-Sol Sim, Ye Lin Kim, Kye Man Cho, Ki-Ho Son
Gyeongsang National University, Korea (Republic of)

PS01-24 [Lighting technology]

Blue and UV-A light wavelengths positively affected the accumulation of healthy compound profiles in pakchoi

Yinjian Zheng, Pengpeng Mao, Yaliang Xu, Gaofeng Liu, Qingming Li
Chinese Academy of Agricultural Sciences (CAAS), China

PS01-25 [Greenhouse crops modelling and management]

Production of faba bean (*Vicia faba* L.) inside a Mediterranean naturally ventilated solar greenhouse

Francisco Domingo Molina Aiz, F.J. Palmero-Luque,
Universidad de Almería, Spain

PS01-26 [Lighting technology]

Effect of UV-B irradiation on the concentrations of rosmarinic acid in different leaf positions of red perilla

Hideo Yoshida, Ikumi Asaoka, Shoko Hikosaka, Eiji Goto
Chiba University, Japan

PS01-27 [Greenhouse crops modelling and management]

An organic fertilization system to sustain plastic-ho use soil health

Jinlong Dong
Institute of Soil Science, Chinese Academy of Sciences, China

PS01-28 [Greenhouse crops modelling and management]

Optimal leaf temperature for photosynthesis in melon plants predicted by stomatal conductance under soilless cultivation

Seungri Yoon[1], Jin Hyun Kim[1], Minju Shin[1], Ji Wong Bang[1], Ho Jeong Jeong[1], Tae In Ahn[2]

[1]National Institute of Horticultural and Herbal Science

[2]Seoul National University

PS01–29 [Vertical farming]

Total evapotranspiration estimation in multi-crop layers of indoor vertical farms for energy savings

Tundra Ramirez, Oliver Körner

Leibniz Institute of Vegetable and Ornamental Crops

PS01–30 [Lighting technology]

Blue Light, Higher Humidity, and Horticultural Substrate Promote the Adventitious Root Development of Hemp (*Cannabis sativa* L.) Cuttings

Seungyong Hahm, Yongjae Lee, Juhyung Shin, Jong Seok Park,

Chungnam National University, Korea (Republic of)

PS01–31 [Climate control and modelling]

Shading by solar panels influences growth and crop characteristics of kimchi cabbage in an agrivoltaic system

Dr. Wook Oh

Department of Horticultural Science, Jeju National University, Korea (Republic of)

PS01–32 [Climate control and modelling]

Reduction effect of fugitive dust by crop cultivation in reclaimed land

Jinwon Park, IlHwan Seo, Jae-Gwon Son

Jeonbuk National University, Korea (Republic of)

Tuesday October 24, 2023

8:00	Registration 8:00-18:00			
8:30	Keynote speaker 8:30-9:30 Speaker: E.J. van Henten Chair: E. Fitz-Rodriguez			
9:30	Symposia photo and Coffee break 9:30-10:00			
10:00	Oral session 10:00-11.40			
	OS-9	**OS-10**	**OS-11**	**OS-12**
	Lighting Technology II Chair: Y. Zheng OS09-01: E. Olvera (Invited) OS09-02: Y. Zhang OS09-03: Y. Zheng OS09-04: K. Weerheim	**Fertigation, water and growing medium I** Chair: R. Hernández OS10-01: S. Kim OS10-02: Ch. Kubota OS10-03: E. Kempen OS10-04: S. Craeye OS10-05: O. Jakobsen	**Sensors, automation, and robotics in greenhouses I** Chair: J. Sanchez-Molina OS11-01: P. de Heer OS11-02: K. Shimomoto OS11-03: S. Kang OS11-04: T. Dunkel OS11-05: S. Toda	**Organic Greenhouse Horticulture: Soil health and biological assessments** Chair: B. Alsanius OS12-01: B. Alsanius (Invited) OS12-02: O. Altuntas OS12-03: A. Rosberg OS12-04: J. Grossman
11:40	Coffee break 11:40-12:00			
12:00	Oral session 12:00-13:20			
	OS-9	**OS-10**	**OS-11**	**OS-12**
	OS09-05: G. Buss OS09-06: H. Vitoshkin OS09-07: R. Hernandez OS09-08: F. Orsini	OS10-06: Z. Ahmed OS10-07: M. Gang OS10-08: G. Hutchinson OS10-09: R. Ferrarezi	OS11-06: A.Fuentes OS11-07: K. Wacker OS11-08: D. Kim OS11-09: T. Moon	OS12-05: S. Pedersen OS12-06: F. Di Gioia OS12-07: H. Alvarado-Raya OS12-08: L. Ouyang
13:20	Lunch			
15:00	Oral session 15:00-17:00			
	OS-13	**OS-14**	**OS-15**	**OS-16**
	Greenhouse systems and design Chair: P. E. Bournet OS13-01: H. Fatnassi OS13-02: Y. Moon OS13-03: E. Darby OS13-04: K. Li OS13-05: J. Flores-Velázquez OS13-06: T. Fukuyama	**Fertigation, water and growing medium II** Chair: Ch. Kubota OS14-01: S. Craeye OS14-02: O. Jakobsen OS14-03: G. Hutchinson OS14-04: N. Katsoulas OS14-05: T. Ramirez OS14-06: F. Di Gioia	**Sensors, automation, and robotics in greenhouses II** Chair: E. Fitz-Rodríguez OS15-01: F. de Zwart OS15-02: R. Sakata OS15-03: M. Iradukunda OS15-04: K. Sparke OS15-05: J. Sánchez-Molina OS15-06: Ch. Paille	**Organic Greenhouse Horticulture: Crop systems and management** Chair: M. Dorais OS16-01: S. Persello OS16-02: G. Paquet OS16-03: D. Dannehl OS16-04: Y. Cho OS16-05: In-Bok Lee OS16-06: K. Ziane
17:00	Poster session with coffee break 17:00-18:00			
18:00	Workshops 18:00-19:30			
	Workshop 1	Workshop 2	Workshop 3	Workshop 4

Oral presentations: Tuesday October 24, 2023

8:30–9:30 KEYNOTE LECTURE 2
Chair: E. Fitz-Rodriguez

Speaker: E.J. van Henten
Wageningen University & Research

10:00–11:40 ORAL SESSION 9 / Lighting Technology II
Chair: Y. Zheng

OS09-01
LED Light Technology in Mexican Agriculture
José Ernesto Olvera González
Technological Institute of Pabellón of Arteaga in Aguascalientes, México

OS09-02
Acclimation to either daytime or nighttime supplementary UVB light increases leaf photosynthesis and photoprotection of young cucumbers
Yuqi Zhang[1], Jun Wang[2], Tao Li[1]
[1]IEDA, Chinese Academy of Agricultural Sciences, China
[2]Institute of Vegetables and Flowers, Chinese Academy of Agricultural Sciences, China

OS09-03
Effect of Light Intensity and Branch Origin Position on Cannabis sativa Inflorescence Density and THC Content
Youbin Zheng, Sebastian Dam
University of Guelph, Canada

OS09-04
Effects of LED light spectrum on light use efficiency, resilience and gene expression in a high-wire cucumber cultivation
Kees Weerheim, Kirsten Leiss, Puspa Khanal Joshi, Mark van Hoogdalem
Wageningen University & Research, Netherlands

12:00–13:20 ORAL SESSION 9 / Lighting Technology II

OS09-05

An assessment of lettuce growth performance using GREENBOX technology with different light concentrations and colors

George Buss[1], Mya Griffith[1], Paige Carroll[1], John L. Griffis[1], Ozlem Tuncay[2], Barry H. Rosen[1], Xiusheng Yang[3], Galen Papkov[1], Sarah Bauer[4], Kathryn Jackson[1], Ankit Singh[1]
[1]Florida Gulf Coast University, United States of America.
[2]EGE Universitesi, Turkey.
[3]University of Connecticut, , United States of America.
[4]Mercer University, Georgia, United States of America.

OS09-06

Light Distribution in a Two-level Unit with Supplemental LED Lighting in a Hydroponic Greenhouse

Helena Vitoshkin[1], Vitaly Haslavsky[2], Mollie Sacks[3], Eviathar Ziffer[1]
[1]Agricultural Research Organization of Israel, Israel
[2]Azrieli College of Engineering, Israel
[3]Ministry of Agriculture and Rural Development, Israel

OS09-07

Impacts of LED light intensity on the transient expression of GUS gene in soybean (*Glycine max*) with half-seed transformation method

Ricardo Hernandez, Xiaonan Shi
[1]North Carolina State University, United States of America

OS09-08

Do we light enough? Optimization of light use efficiency in a vertical farm by modulation of light intensity, photoperiod and far-red radiation

Giuseppina Pennisi, Laura Carotti, Alessandro Pistillo, Ilaria Zauli, Giorgio Gianquinto, Francesco Orsini
University of Bologna, Italy

10:00–11:40 ORAL SESSION 10 / Fertigation, water and growing medium I

Chair: J. Son

OS10-01

Ozone-nano Water can Promote the Growth and Secondary Metabolites of Horticultural Plants in Hydroponic Systems

SunWoo Kim[1], Gwonjeong Bok[1], Juhyung Shin[1], Jongseok Park[1], Jong-won Do[2]
[1] Chungnam National University, Korea (Republic of)
[2] Rural Research Institute, Korea Rural Community Corporation, Korea (Republic of)

OS10-02

Hydroponic crop production with low-pH nutrient solution for mitigating risks of root-rot diseases

Chieri Kubota, Jeffrey Bates, Daniel Gillespie, Gio Papio, Ian Rabinowitz, Sally Miller

[1]The Ohio State University, United States of America

OS10-03

Improving the sustainability of hydroponic systems through optimisation of the nutrient solution composition

Estelle Kempen

Stellenbosch University, South Africa

OS10-04

Hy4Dense, a newly developed hydroponics system for leafy vegetables sown at high density

Maarten Ameye[1], Simon Craeye, Elise Tardy[1], An Decombel[1], Lydia Smith[2], Matthijs Blind[3], Jasper Schermer[3], John Stamford[4], Bart Grimonprez[5], Tracy Lawson[4]

[1]INAGRO, Belgium

[2]NIAB Innovation Farm, United Kingdom

[3]Vertify, Netherlands

[4]University of Essex, United Kingdom

[5]Howest University of Applied Sciences (Belgium), Belgium

OS10-05

Monitoring and control of nitrate in closed-loop hydroponics

Oyvind M. Jakobsen, Kai Arne Kristiansen, Mona Schiefloe, Ann-Iren Kittang Jost

NTNU Social Research, Norway

12:00-13:20 ORAL SESSION 10 / Fertigation, water and growing medium I

OS10-06

A sustainable eco-friendly approach for vegetable production in hydroponics

Zienab Ahmed[1], Khuloud Alneyadi[1], Shamma aldhaheri[1], Eida Almansoori[1], Aysha haji Alka haji Alkaabi[1], Mariam AL Hebsi[1], Fatima Hassan[1], Francisco Di Gioia[2], Nikolaos Tzortzakis[3]

[1]College of Agriculture and Veterinary Medic, United Arab Emirates University, United Arab Emirates

[2]College of Agricultural Science, Pennsylvania State University, United States of America

[3]Biotechnology and Food Science, Cyprus University of Technology, Cyprus

OS10-07

Development of an Ion Selective Electrode-based Nutrient Management System to Maintain Ionic Balance in Closed Hydroponic Solutions

Min-Seok Gang[1], Hak-Jin Kim[1], Woo-Jae Cho[2], Tae In Ahn[1], Joo-Shin Kim[1], Ju Young Lee[3], Ji-Eun Hwang[4], Jae Wook Jang[5]
[1]Seoul National University, Korea (Republic of)
[2]Gyeongsang National University, Korea (Republic of)
[3]Korea Institute of Science Technology, Korea (Republic of)
[4]Gyeonggi-do Ag. Research Extension Service, Korea (Republic of)
[5]SHINHAN A-TEC Co., Ltd., Korea (Republic of)

OS10-08

To leach or not to leach: water management strategies for hydroponic strawberry production

George Hutchinson, Rhuanito Ferrarezi
University of Georgia, United States of America

OS10-09

Alternative substrates for arugula and lettuce production in greenhouses

Rhuanito Ferrarezi, Lan Nguyen, Samuel Poole, Matthew Housley, Kuan Qin
University of Georgia, United States of America

10:00–11:40 ORAL SESSION 11 / Sensors, automation, and robotics in greenhouses I

Chair: J. Sanchez-Molina

OS11-01

Semantic Explanation and Navigation System for Greenhouse Robotics Systems

Paolo de Heer, Jack Verhoosel
TNO, Netherlands

OS11-02

Development of Double-Camera AI System for Efficient Monitoring of Paprika Fruits

Kota Shimomoto[1], Mitsuyoshi Shimazu[1], Takafumi Matsuo[2], Syuji Kato[2], Hiroki Naito[1], Tokihiro Fukatsu[1]
[1]National Agriculture and Food Research Organization (NARO), Japan
[2]Takahiko Agro-business co., ltd., Japan

OS11-03

Decision of Optimal Sensor Location for predicting the Internal Environment of Greenhouse using Machine Learning Model

Sol-moe Kang, In-bok Lee, Hyo-hyeog Jeong, Jeong-hwa Cho, Young-bae Choi, Da-in Kim, Seo-ha Park
Seoul National University, Korea (Republic of)

OS11-04

Novel fruit growers advisory system using connected fruit dendrometer, micro-climate data and machine learning algorithms

Theresa Dunkel[1], Elena Najdenovska[1], Fabien Dutoit[1], Laura Elena Raileanu[1], Robert Whittaker[2], Cédric Camps[1]
[1]Agroscope, Switzerland
[2]JDC Electronic SA, Switzerland

OS11-05

Imaging of strawberry's vegetation indexes by hand-held smartphone

Seitaro Toda[1], Yuya Imai[1], Takeru Kanoh[2], Naomichi Fujiuchi[2], Kotaro Takayama[1]
[1]Toyohashi University of Technology, Japan
[2]Faculty of Agriculture / Graduate School of Agriculture, Japan

12:00-13:20 ORAL SESSION 11 / Sensors, automation, and robotics in greenhouses I

OS11-06

Crop growth monitoring with time series data based on deep learning techniques

Alvaro Fuentes[1], Jiuqing Dong[1], Jaehwan Lee[1], Taehyun Kim[2], Sook Yoon[3], Dong Sun Park[1]
[1]Jeonbuk National University, Korea (Republic of)
[2]National Institute of Agricultural Science, Korea (Republic of)
[3]Mokpo National University, Korea (Republic of)

OS11-07

Multispectral imaging for pH induced micronutrient deficiency detection

Kahlin Wacker, Marc van Iersel
University of Georgia, United States of America

OS11-08

Detecting Rice Blast using Hyperspectral Imagery

Daeyoung Kim, Seongmin Park, Suk-Ju Hong, Sang-Yeong Kim, Eungchan Kim, Chang-Hyup Lee, NanditaIrsaulul Nurhisna, Sungjay Kim, Yangjae-daero, Songpa-gu
Seoul National University, Korea (Republic of)

OS11-09

Automated Feature Extraction of Lettuce Grown in Vertical Farms with Image Processing and Deep Neural Networks

Taewon Moon[1], Da-Seul Choi[2], Tae In Ahn[1], Myung-Min Oh[2]
[1]Seoul National University, Korea (Republic of)
[2]Chungbuk National University, Korea (Republic of)

10:00–11:40 ORAL SESSION 12 / Organic Greenhouse Horticulture: Soil health and biological assessments

Chair: B. Alsanius

OS12-01

The riddle of soil biological assessments in organic greenhouse horticulture

Beatrix Alsanius, Anna Karin Rosberg
SLU Alnarp Microbial Horticulture Unit, Sweden

OS12-02

The Effect of Using Biofertilizers on Yield and Quality in Endive Lettuce (*Cichorium endivia* L.) Cultivated in Soilless Culture

Ozlem Altuntas, Sena Nur Gur
Malatya Turgut Ozal University, Turkey

OS12-03

Short crop rotations in organic greenhouse production: consequences for soil health

Anna Rosberg, Beatrix Alsanius
SLU Alnarp Microbial Horticulture Unit, Sweden

OS12-04

Legume cover crop nitrogen contributions in organic high tunnels in the United States

Julie Grossman[1], Miriam Gieske[1], Ada Fitz Axen[2], Harywilliam Gonzales[3], Hannah Walsh[1]
[1]University Of Minnesota, United States of America
[2]Colorado State University, United States of America
[3]University of Puerto Rico at Utuado, Puerto Rico

12:00–13:20 ORAL SESSION 12 / Organic Greenhouse Horticulture: Soil health and biological assessments,.

OS12-05

Soil health and local recirculation ensuring organic cucumber cultivation in Norway

Susanne Friis Pedersen[1], Kaia Slaagedal[2], Michel Verheul[2]
[1]Norwegian Centre for Organic Agriculture, Norway
[2]University College for Agriculture, Norway

OS12-06

Leveraging By-Products of the Agri-Food Industry for the Application of Anaerobic Soil Disinfestation in Organic High Tunnel Vegetable Production

Francesco Di Gioia[1], Joe Ono-Raphel[1], Kathleen Arrington[1], Raymond Balaguer[1], Francisco Dini-Andreote[1], Jason Kaye[1], Erin Rosskopf[2]
[1]University Park, United States of America
[2]Horticultural Research Laboratory, United States of America

OS12-07

Reusing organic substrates and plants increases irrigation water use efficiency without affecting plant yield in a day neutral strawberry pot production system

Horacio E. Alvarado-Raya[1], J. Armando Ramirez-Arias[1], Roberto Rivera-del-Rio[1], Maria Eugenia Estrada-Chavira[2], Pablo Emilio Escamilla-Garcia[3], Guillermo Calderon-Zavala[4]
[1]Universidad Autónoma Chapingo, México
[2]Tecnológico Nacional de México, México
[3]Instituto Politécnico Nacional, México
[4]Colegio de Posgraduados, México

OS12-08

The feasibility of growing media originated from greenhouse waste for plant seedling and growing

Lin Ouyang[1], Rui Yang[2], Dongdong Zhang[2]
[1]Chengdu National Agricultural Science and, Technology Center, China
[2]Chinese Academy of Agricultural Sciences, China

15:00–17:00 ORAL SESSION 13 / Greenhouse systems and design
Chair: T. Bartzanas

OS13-01
Transforming Agriculture for a Changing Climate: Harnessing Precision Technologies and Controlled Environments to Enhance Food Security in Arid and Semi-arid zones
Hicham Fatnassi[1], Rashyd Zaaboul[1], Ali El Battay[2], Jeetendra Prakash Aryal[1], Nazim Gruda[3]
[1]International Center for Biosaline Agriculture, United Arab Emirates
[2]Center for Remote Sensing Applications, CRSA Mohammed VI Polytechnic University, Morocco
[3]University of Bonn, INRES, Division of horticulture, Germany

OS13-02
Development, Correction, and Testing of a Semi-Open Chamber System for Gas Exchanges Measurement of Cucumber Seedlings
Yu Hyun Moon, Ui Jeong Woo, Ha Seon Sim, Tae Yeon Lee, Ha Rang Shin, Jung Su Jo, Sung Kyeom Kim
Kyungpook National University, Korea (Republic of)

OS13-03
Cultivar selection of mizuna for optimal space station performance
Ethan Darby, Sarah Parker, Kellie Walters
University of Tennessee, United States of America

OS13-04
Modeling and Optimization of Ultraviolet LED Nutrient Solution Sterilization Module
Kun Li, Ruifeng Cheng, Haochun Ke
Chinese Academy of Agricultural Sciences, China

OS13-05
Comprehensive CFD model to analyze potential Mexican greenhouse horticulture zones
Jorge Flores[1], C. Ernesto Aguilar[2], Edwin Villagran[3], Abraham Rojano[4]
[1]Colegio de Potgraduados, México
[2]Instituto Tecnológico de los Reyes, México

[3]AGROSAVIA, Colombia
[4]Universidad Autónoma Chapingo, MéxicoOS13-06
Vinblastine production of Catharanthus roseus in the plant factory using artificial lighting
Taro Fukuyama, Tatsuki Hanyu, Shun Ishizu, Rio Saito, Keiko Ohashi-Kaneko
Tamagawa Academy & University, Japan

15:00–17:00 ORAL SESSION 14/ Fertigation, water and growing medium II

Chair: Ch. Kubota

OS14-01

Agrotopia, a platform to test alternative water sources for urban horticulture

Maarten Ameye, Simon Craeye
Inagro, Belgium

OS14-02

Consumption of and preference for NH4+ versus NO3- of hydroponically cultivated lettuce in different NH4+/NO3- ratios

Oyvind M. Jakobsen[1], Mona Schiefloe[1], Armida Gjindali[2], Irene Karoliussen[1], Ann-Iren Kittang Jost[1]
[1]CIRiS, NTNU Social Research, Norway
[2]University of Manchester, United Kingdom

OS14-03

Can they dig it? Hydroponic system comparison for greenhouse strawberry production

George Hutchinson, Rhuanito Ferrarezi
University of Georgia, United States of America

OS14-04

Drainage management in a cascade hydroponic system: Combination of cucumber and melon crops

Nikolaos Katsoulas, Ioannis Naounoulis, Sofia Faliagka
University of Thessaly, Dept. of Agriculture, Rural Development and Environment, Greece

OS14-05

Transpiration rates for suitable crop combinations of Cascade hydroponics systems

Tundra Ramirez[1], Nikolaous Katsoulas[2], Oliver Körner[1]
[1]IGZ-Leibniz Institute of Vegetable and Ornamental Crops e.V., Germany
[2]University of Thessaly, Greece

OS14-06

Spent Mushroom Compost as an Alternative to Peat-based Soilless Media for Greenhouse Potted Basil Production

Trevor Johnson, Francesco Di Gioia
Pennsylvania State University, United States of America

15:00–17:00 ORAL SESSION 15/ Sensors, automation, and robotics in greenhouses II
Chair: E. Fitz-Rodríguez

OS15-01
Autonomous greenhouse and crop control in cucumber
Anja Dieleman, Anna Petropoulou, Ilias Tsafaras, Monique Bijlaard, Anne Elings, Feije De Zwart, Bart van Marrewijk, Guido Jansen, Selwin Hageraats, Georgios Ntakos
Wageningen University & Research, Netherlands

OS15-02
Utility-Purpose Small Robots for Farmers: A Case Study on Harvesting Apples
Ryota Sakata, Takayuki Tsukamoto, Keita Yoshinaga
Institute of Agricultural Machinery, NARO, Japan

OS15-03
Seedling Vigor and Germination Rate of Lettuce Cultivars Quantified Using a Simple and Automated Imaging Technique
Mark Iradukunda, Marc van Iersel†, Rhuanito S. Ferrarezi
University of Georgia, United States of America

OS15-04
The impact of automation and digitalization on management and labor in greenhouse operations in German horticulture – a mixed methods investigation
Kai Sparke, Mira Lehberger, Sam Schröder
Geisenheim University, Germany

OS15-05
Navigation of a Differential Robot for Transporting Tasks in Mediterranean Greenhouses
Jorge Antonio Sánchez Molina, Ángel López-Gázquez, Francisco José Mañas-Alvarez, José Carlos Moreno Úbeda, Fernando Cañadas
Universidad de Almería, Spain

OS15-06
Food production in future human space exploration: when and how to envisage a crop production system
Christel Paille, Brigitte Lamaze
European Space Research and Technology Centre (ESTEC), Netherlands

15:00–17:00 ORAL SESSION 16 / Organic Greenhouse Horticulture: Crop systems and management

Chair: M. Dorais

OS16-01

Assessing the Benefits and Limitations of a Dynamic Agrivoltaic Greenhouse for Crop Protection and Yield Optimization in a Changing Climate

Séverine Persello[1], Gerardo Lopez[1], Jérôme Chopard[1], Perrine Juillion[1], Vincent Hitte[1], Yassin Elamri[1], Romain Grizou[2], Fanny Thiery[2], Damien Fumey[1]
[1]Sun'Agri, France
[2]Invenio & Chambre d'agriculture, France

OS16-02

A new rotating vertical growing system for the production of organic lettuce

Guillaume Paquet, Annie Bregard, Thi Thuy An Nguyen, Martine Dorais
Université Laval, Canada

OS16-03

Development of a hybrid aeroponic-water-buffer system for intensive tomato production

Dennis Dannehl[1], Raquel Salazar[2], Efrén Fitz-Rodriguez[2], Irineo Lopez-Cruz[2], Abraham Rojano-Aguilar[2], Christian Ulrichs[1], Uwe Schmidt[1]
[1]Humboldt – Universität zu Berlin, Germany
[2]Universidad Autónoma Chapingo, México

OS16-04

Development of a Seasonal Leafy Vegetable Crop Model for Rooftop Greenhouse Energy Model

Jeong-hwa Cho, In-bok Lee, Yun-woo Cho, Young-bae Choi, Hyo-hyeok Jeong, Sol-moe Kang, Da-in Kim
[1]Seoul National University, Korea (Republic of)

OS16-05

Energy Saving Design and Control Strategy for Sustainable Rooftop Greenhouse with Passive and Active Heat Transfer Methods

Jeong-hwa Cho, In-bok Lee, Young-bae Choi, Hyo-Hyeog Jeong, Sol-moe Kang, Da-In Kim, and Youn-woo Cho
[1]Seoul National University, Korea (Republic of)

OS16-06

Testing the Interaction of Strawberry Cultivars with organic and conventional cropping systems in Morocco

Kawtar Ziane, Lamiae Ghaouti, Mustapha Arbaoui
Institut Agronomique et Vétérinaires Hassan II, Morocco

PS02: Poster presentations: Tuesday October 24, 2023

PS02-01 [Growing media, water management and hydroponics]

Dynamic irrigation control under evapotranspiration uncertainty

Francisco D. Mondaca Duarte, Daniel Reyes Lastiri, Jan-David Wacker, Simon van Mourik, Eldert van Henten
Wageningen University & Research, Netherlands

PS02-02 [Greenhouse crops modelling and management]

Seed priming improves yield attributes of tomato under salt stress in greenhouse conditions

Nasratullah Habibi
Tokyo University of Agriculture NODAI, Japan

PS02-03 [Sensors, automation, and robotics in greenhouses]

Development of a system using acceleration sensor for automatic collection of work records in a greenhouse

Mitsuyoshi Shimazu, Kota Shimomoto, Tokihiro Fukatsu
National Institute of Animal Health (NARO), Japan

PS02-04 [Sensors, automation, and robotics in greenhouses]

A main stem-based operation method for a cultivation management robot system in greenhouse horticulture

Tokihiro Fukatsu, Masakazu Kashino, Natsuki Nakayama, Hideto Kurosaki
National Institute of Animal Health (NARO), Japan

PS02-05 [Sensors, automation, and robotics in greenhouses]

Detection of tomato main-stem skeleton using point cloud segmentation

Masakazu Kashino, Tokihiro Fukatsu, Hideto Kurosaki, Natsuki Nakayama
National Institute of Animal Health (NARO), Japan

PS02-06 [Sensors, automation, and robotics in greenhouses]

Design of Intelligent Tomato Disease Image Classification System Based on Complex Environmental Information

Taehyun Kim, Jeonghyun Baek, Donghyoek Im
Rural Development Administration, Korea (Republic of)

PS02-07 [Greenhouse systems and design]

Urban smart farms: architectural approach and system design

Nahyang Byun, Donghwa Shon
Chungbuk National University, Korea (Republic of)

PS02-08 [Sensors, automation, and robotics in greenhouses]

Counting the number of cherry tomato fruits by using a hanging-type imaging robot: the relationship between the width of image analysis and the fruit number per plant

Kaede Tauchi[1], Naomichi Fujiuchi[1], Takeru Kanoh[2], Seitaro Toda[3], Kotaro Takayama[3]
[1]Ehime University, Japan
[2]PLANT DATA Co., Ltd., Japan
[3]Toyohashi University of Technology, Japan

PS02-09 [Growing media, water management and hydroponics]

Influence of the growing media on phytochemical composition of six salad rocket (*Eruca sativa*) accessions

Juan A. Fernandez[1], Catalina Egea-Gilabert[1], Jesús Ochoa[1], Fabio Amoruso[1], Angelo Signore[1], Víctor Gallegos-Cedillo[1], Raúl Domínguez-Perles[2]
[1]Universidad Politécnica de Cartagena, Spain
[2]CEBAS-CSIC, University Campus, Spain

PS02-10 [Growing media, water management and hydroponics]

Design and implementation of Wireless sensor and control network for Deep Flow Technique (DFT) in Hydroponic Systems

Rodrigo Morfin Magaña, Cruz Ernesto Aguilar Rodríguez, Jesus Andany Zepeda García
TecNM Campus Los Reyes, México

PS02-11 [Growing media, water management and hydroponics]

Load cell-based automated irrigation system for efficient irrigation management of plug production

Jongyun Kim[1], Seong Kwang An[2], Sunghyun Oh[1]
[1]Korea University, Korea (Republic of)
[2]Pusan National University, Korea (Republic of)

PS02-12 [Sensors, automation, and robotics in greenhouses]

Development of a high-precision, non-destructive technique for estimating individual and plug tray unit plant height and leaf area in red pepper seedlings using Plant Image Measurement System (PIMS)

Solly Kang[1], Young Eun Jeon[1], Yu Kyeong Shin[1], Seung Wook Song[2], Han Ryul Seo[2], Jun Gu Lee[1]

[1]Jeonbuk National University, Korea (Republic of)

[2]Podo INC., Korea (Republic of)

PS02-13 [Greenhouse systems and design]

AstroPlant: a novel IT infrastructure and network of plant growth chambers

Stefania De Pascale[1], Antonio Pannico[1], Thieme Hennis[2], Luigi Gennaro Izzo[1], Giovanna Aronne[1], Christel Paillé[3]

[1]University of Naples Federico II, Italy

[2]Delft University of Technology, Netherlands

[3]European Space Agency, ESA-ESTEC, Netherlands

PS02-14 [Growing media, water management and hydroponics]

Substrate comparison for tomato propagation under different irrigation protocols

Uttara Samarakoon[1], Alexa Espinoza[2], James Altland[2], Leslie Taylor[1], Teng Yang[1]

[1]Ohio State University ATI, United States of America

USDA-ARS, United States of America

PS02-15 [Greenhouse systems and design]

Novel Greenhouse Cooling Technology Using Natural Cold Energy in Winter

Youngjik Youn, Jaejoon Choi, Sae Byul Kang, Hyun Hee Le

Korea Institute of Energy Research, Korea (Republic of)

PS02-16 [Greenhouse systems and design]

Use of 'double roof' with photoconversion films to improve yield and photosynthetic activity in Mediterranean greenhouses

Diego L. Valera[1], María Ángeles Moreno-Teruel[2], Francisco D. Molina-Aiz[1], Kristof Proost[3], Frederic Peilleron[3], Alejandro López-Martínez[1]

[1]Universidad de Almería, Spain

[2]Universidade de Évora, Portugal

[3]Centre dffaires Emergence, France

PS02-17 [Growing media, water management and hydroponics]

Evaluation of Decision Tree-based Ion-Specific Dosing Algorithm for Closed Hydroponics

Yeong-Hyeon Shin[1], Woo-Jae Cho[1], Min-Seok Gang[2], Hak-Jin Kim[2], Young-Kyun Jang[3]

[1]College of Agriculture and Life Sciences, Korea (Republic of)

[2]Seoul National University, Korea (Republic of)

[3]GreenCS, Damyang-gun, Korea (Republic of)

PS02-18

Assessment of nutritional properties of Valerianella locusta plants growing in indoor vertical farms under different lighting conditions

Niki Mougiou[1], Spyros Didos[1], Ioanna Bouzouka[1], Dafni Despoina Avgoustaki[2], Anagnostis Argiriou[3]

[1]Institute of Applied Biosciences, Centre for Research and Technology Hellas, Greece

[2]Agricultural University of Athens, Grece

[3]University of the Aegean, Greece

PS02-19 [Growing media, water management and hydroponics]

Optimization of nutrient solution concentration improves plant growth and secondary metabolites of Cannabis sativa L in hydroponics

Juhyung Shin, Seungyong Ham, Jongseok Park

Chungnam National University, Korea (Republic of)

PS02-20 [Vertical farming & plant factory]

Calibration and evaluation of a simplified dynamic model for lettuce grown in a mini plant factory

Agustin Ruiz-Garcia[1], Joshua Esaú Patiño-Espejel[1], Irineo L. López-Cruz[1], Joel Pineda-Pineda[1], Ernesto Olvera-González[2]

[1]Universidad Autónoma Chapingo

[2]Instituto Tecnológico Pabellón de Arteaga, México

PS02-21 [Growing media, water management and hydroponics]

Change in physicochemical properties of coconut coir during five cultivation cycles of blueberry (*Vaccinium* spp.) cv biloxi

Joel Pineda Pineda, Andrea B. Jacobo-Hernández, Mateo Vargas-Hernández, J. Armando Ramírez-Arias

Universidad Autónoma Chapingo, México

PS02-22 [Greenhouse crops modelling and management]

Dynamic lettuce growth model for temporal spectral changes

Eunjeong Lim[1], Myung-Min Oh[2], Tae In Ahn[1]
[1]Seoul National University, Korea (Republic of)
[2]Chungbuk National University, Cheongju, Korea (Republic of)

PS02-23 [Greenhouse crops modelling and management]

Simplified greenhouse climate and crop model predicts yield using Bayesian inference

Juan Daniel Molina Muñoz[1], Antonio Capella Kort[2], Aarón I. Vélez-Ramírez[3], J. Andrés Christen[4]
[1]Centro de Investigación en Matemáticas, Colombia
[2]Instituto de Matemáticas, Universidad Nacional Autónoma de México, México
[3]Universidad Nacional Autónoma de México, México
[4] Centro de Investigación en Matemáticas, CIMAT, México

PS02-24 [Growing media, water management and hydroponics]

Growth evaluation of the tomato root system cultivated in two hydroponic systems

Armando Ramirez Arias, Joel Pineda-Pineda, Horacio Alvarado-Raya, Ximena Lopez-Zamora
Universidad Autónoma Chapingo, México

PS02-25 [Sensors, automation, and robotics in greenhouses]

Machine Learning image classifier: autonomous fertilization management of indoor-grown lettuce for baby leaf production

Matteo Landolfo, Giuseppina Pennisi, Francesco Orsini
University of Bologna, Italy

PS02-26 [Growing media, water management and hydroponics]

Rosa 'Bonica 82' cuttings in aeroponic system: optimization of light spectrum for adventitious root formation

Alessandro Pistillo, Andrea D'Aprile, Maria Eva Giorgioni, Francesco Orsini, Giuseppina Pennisi, Giorgio Gianquinto
University of Bologna, Italy

PS02-27 [Vertical farming & plant factory]

Architectural design based on light performance of urban rooftop smart farm

Donghwa Shon, Nahyang Byun, jisu hur, Eunteak Lim
Chungbuk National University, Cheongju, Korea (Republic of)

PS02-28 [Organic greenhouse horticulture]

Conditions and Directions to Distribute the Rooftop Greenhouse in Korea

Eunseok Lee, Sunjoon Kim,Kyounghun Min, Jisoo Ahn, Seokhwan Ji
Architecture Urban Research Institute, Korea (Republic of)

PS02-29 [Growing media, water management and hydroponics]

Technology transfer from aquaculture to horticulture: rectangular sedimentation filter does not meet efficacy thresholds set for closed horticultural cropping systems

Beatrix Waechter Alsanius[1], Thomas Brand[2]
[1]Swedish University of Agricultural Sciences, Sweden
[2]Chamber of Agriculture in Lower Saxony, Germany

PS02-30 [Organic greenhouse horticulture]

How can high tunnel coverings and an insect-proof barrier improve productivity and pest management in berry crops?

Martine Dorais, Andréane Couture, Annie Brégard
Université Laval, Canada

PS02-31 [Organic greenhouse horticulture]

The spread of *Botrytis cinerea* in green leaf lettuce *in vitro*

Viktorija Vastakaite-Kairiene, Alma Valiuskaite, Kristina Buneviciene, Neringa Rasiukeviciute
Lithuanian Research Centre for Agriculture and Forestry, Lithuania

PS02-32 [Organic greenhouse horticulture]

Determination of weight on index indicating seedling quality using AHP (Analytic Hierarchy Process) in tomato

Hye-jin Lee, Ki Bum Kweon, Hee-Ju Lee, Seung-Hwan Wi, Jin-Hyoung Lee
Vegetable Research Division, NIHHS, RDA, Korea (Republic of)

PS02-33 [Vertical farming & plant factory]

Comparison of various crop models in greenhouse CFD model design: Porous medium model and 3-dimensional crop structure model

Sol-moe Kang, Sang-yeon Lee, Jun-gyu Kim, Dae-heon Park, Se-han Kim, In-bok Lee
Seoul National University, Korea (Republic of)

Wednesday October 25, 2023

8:00	Registration 8:00-18:00			
8:30	Keynote speaker 8:30-9:30 Speaker: S. De Pascale Chair: R. Salazar-Moreno			
9.30	Coffee break 9:30-10:00			
10:00	Oral session 10:00-11.40			
	OS-17	**OS-18**	**OS-19**	**OS-20**
	CFD Modelling Chair: M. Kacira OS17-01: In-Bok Lee (Invited) OS17-02: I. Tsafaras OS17-03: In-Bok Lee OS17-04: A. Kintu	**Fertigation, water, and growing media III** Chair: J. Pineda-Pineda OS18-01: D. Zhang OS18-02: A. Poleatewich OS18-03: R. Salazar-Moreno OS18-04: J. Quijia Pillajo OS18-05: E. Romantchik	**Plant production, protection, and quality** Chair: E. Schrevens OS19-01: A. Mayorga-Gomez OS19-02: E. Hernández OS19-03: Z. Wang OS19-04: E. Schrevens OS19-05: I. Parola-Contreras	**Organic Greenhouse Horticulture: Soil fertility and plant health** Chair: Y. Zheng OS20-01: A. Barrada (Invited) OS20-02: R. Mahmoudi OS20-03: U. Samarakoon OS20-04: O. Altuntas
11:40	Coffee break 11:40-12:00			
12:00	Oral session 12:00-13:20			
	OS-17	**OS-18**	**OS-19**	**OS-20**
	OS17-05: H. Jeong OS17-06: J. Valencia-Islas OS17-07: W. Plas OS17-08: D. D. Avgostaki	OS18-06: T. Jayalath	OS19-06: G. Samouliene OS19-07: D. Zhang OS19-08: W. Sae-Tang OS19-09: F. Di Gioia	OS20-05: T. Endoh OS20-06: E. Boudreau-Forgues OS20-07: E. Solis OS20-08: M. Belley
13:20	Lunch			
15:00	Oral session 15:00-17:00			
	OS-21	**OS-22**	**OS-23**	**OS-24**
	Energy in greenhouses Chair: R. Salazar-Moreno OS21-01: S. Hemming OS21-02: I. Tsafaras OS21-03: Y. Zhang OS21-04: M. Ishii OS21-05: R. Errais OS21-06: S. Hemming	**Environmental impact and sustainable production** Chair: N. Gruda OS22-01: Ch. Ulrichs OS22-02: E. Schrevens OS22-03: N. Katsoulas OS22-04: D. Kim OS22-05: C. Probst	**Lighting technology III** Chair: E. Olvera OS23-01: L. Marcelis OS23-02: M. Holweg OS23-03: J. Shin OS23-04: J. Lanoue OS23-05: Ch. Kubota OS23-06: F. Wang OS23-07: X. Hao	**Greenhouse crops management** Chair: I. L. López-Cruz OS24-01: R. Hernandez OS24-02: Y. Cao OS24-03: X. Yang OS24-04: N. García Victoria OS24-05: T. Li OS24-06: E. Rios-Urban
17:00	Poster session with coffee break 17:00-18:00			
18:00	Closing ceremony 18:00-18:30			
20:00	Banquet dinner 20:00-24:00			

Oral presentations: Wednesday October 25, 2023

8:30–9:30 KEYNOTE LECTURE 3
Chair: R. Salazar-Moreno

Speaker: S. De Pascale
University of Naples Federico II, Italy

10:00–11:40 ORAL SESSION 17 / CFD Modelling
Chair: M. Kacira

OS17-01
Diversifying the application of CFD technology on Greenhouse R&D
In-bok Lee
Seoul National University, Rep. of Korea, Seoul, Korea (Republic of)

OS17-02
Evaluating possibilities to create homogeneous greenhouse climate at night time through 3D climate simulations
Ilias Tsafaras, Silke Hemming
Wageningen University & Research, Wageningen, Netherlands

OS17-03
Snow Load Computation of Greenhouse using CFD-DEM Method
Young-Bae Choi, In-bok Lee, Jeong-hwa Cho, Hyo-Hyeog Jeong, Sol-moe Kang, Da-In Kim, Youn-woo Cho
Seoul National University, Seoul, Korea (Republic of)

OS17-04
CFD model design optimization and verification in large-scale Venlo greenhouse complex for tomato cultivation
Anthony Kintu, IlHwan Seo
Jeonbuk National University, Korea (Republic of)

12:00–13:20 ORAL SESSION 17 / CFD Modelling

OS17-05
Ventilation Rate Prediction for Naturally Ventilated Greenhouses using CFD-Driven Machine Learning Model
Hyo-Hyeog Jeong, In-bok Lee, Jeong-hwa Cho, Young-bae Choi, Sol-moe Kang, Da-In Kim
Seoul National University, Rep. of Korea, Seoul, Korea (Republic of)

OS17-06

Recirculating the air from the attic as a pre-renovation control strategy in a greenhouse-type solar dryer

Jose Olaf Valencia Islas[1], Murat Kacira[1], Irineo Lorenzo López Cruz[2], Gene Giacomelli[1], Agustín Ruiz García[2], Peiwen Li[1]
[1]University of Arizona, United States of America
[2]Universidad Autónoma Chapingo

OS17-07

Analysing the Local Climate in a Plant Factory in CFD by Simulating the Heat and Mass Transfer of the Plants using a Realistic Plant Model

Wito Plas, Michel De Paepe, Toon Demeester
Ghent University, Belgium

OS17-08

Numerical evaluation of organic photovoltaics on greenhouse microclimate spatial distribution

Konstantinos Karamanos[1], Dafni D. Avgostaki[1], Nikolaos Katsoulas[2], Thomas Bartzanas[1]
[1]Agricultural University of Athens, Greece
[2]University of Thessaly, Greece

10:00–11:40 ORAL SESSION 18 / Fertigation, water, and growing media III

Chair: J. Pineda-Pineda

OS18-01

Customizing a slightly carbonized biochar as peat alternative in growing media

Dongdong Zhang, Lin Ouyang, Rui Yang
Chinese Academy of Agricultural Sciences, China

OS18-02

The effect of peat moss amended with three engineered wood substrate components on suppression of crown and root rot in floriculture crops

Anissa Poleatewich[1], Martina Florian[1], Brian Jackson[2], Liza DeGenring[1]
[1]University of New Hampshire, United States of America
[2]North Carolina State University, United States of America

OS18-03
Sizing lettuce growing surface in aquaponic systems based on evapotranspiration and fish feed
Raquel Salazar Moreno, Ana Cristina Sánchez Martínez, Joel Pineda Pineda, Irineo López-Cruz
Universidad Autónoma Chapingo, México

OS18-04
Developing a screening pipeline for the identification of phosphorus-solubilizing bacteria
Juan Quijia Pillajo, Sachin Naik, Michelle Jones
The Ohio State University, United States of America

OS18-05
Evaluation of automatic irrigation control systems and shade mesh position for strawberry crop growth (*Fragaria* sp.)
Eugenio Romantchik, Gilberto López Cañtens, Diego Flores
Universidad Autónoma Chapingo, México

12:00–13:20 ORAL SESSION 18 / Fertigation, water, and growing media III

OS18-06
Providing more nitrogen with high light levels can accelerate hydroponic lettuce production
Theekshana Jayalath, Marc van Iersel
University of Georgia, United States of America

10:00–11:40 ORAL SESSION 19 / Plant production, protection, and quality
Chair: E. Schrevens

OS19-01
Photosynthesis, transpiration and water use efficiency of lettuce (*Lactuca sativa*) under varying light intensities
Andres Mayorga-Gomez, Marc van Lersel
University of Georgia, United States of America

OS19-02

Starwars: The use of lasers for indoor pest control

Kirsten Leiss[1], Estuardo Hernandez Olesinski[1], Jesica Perez Rodriguez[1], Joseph Peller[1], Systsma Menno[1], Ilias Tsafaras[1], Edwin Kroon[2]
[1]Wageningen University & Research, Netherlands
[2]Lion Laser Systems, Netherlands

OS19-03

Comparing efficacy of different biostimulants for hydroponically-grown lettuce (*Lactuca sativa* L.)

Zheng Wang, Rui Yang, Zheng Wang, Jiangtao Hu, Li Zhang, Qichang Yang
Chinese Academy of Agricultural Sciences, China

OS19-04

Eddie Schrevens[1], Jérémie Haumont[2], Peter Lootens[2], Jan Diels[1], Tim De Cuypere[3], Onno Bes[4], Jonas Bodyn[5], Wouter Saeys[1]
[1]Katholieke Universiteit Leuven, Belgium
[2]ILVO, Belgium
[3]INAGRO, Belgium
[4]Proefstation voor de Groenteteelt (PSKW), Belgium
[5]Provinciaal Proefcentrum voor de Groenteteelt Oost-Vlaanderen (PCG), Belgium

OS19-05

Comparison of Phenolic Compounds and Antioxidant Activity in three Black Cherry Tomato Varieties Grown Under Greenhouse Conditions

Ixchel Parola-Contreras[1], Josue Daniel Hernández-Vega[2], Erik Gustavo Tovar-Pérez[2], Rosalía Reynoso-Camacho[2], Ramón Gerardo Guevara-González[2]
Claudia Gutiérrez-Antonio[2], Ana Angélica Feregrino-Pérez[2], Rosario Guzmán-Cruz[2]
[1]Tecnológico de Estudios Superiores de Chimalhuacán, México
[2]Universidad Autónoma de Querétaro, México

12:00–13:20 ORAL SESSION 19 / Plant production, protection, and quality

OS19-06

Diverse plant species in relation to improve human nutrition

Giedre Samuoliene, Kristina Lauzike, Leva Gudzinskaite, Gediminas Kudirka, Audrius Pukalskas, Akvile Virsile
Institute of Horticulture, Lithuanian Research Centre for Agriculture and Forestry, Lithuania

OS19-07

The feasibility of growing media originated from greenhouse

Dongdong Zhang
Chinese Academy of Agricultural Sciences, China

OS19-08

Flower induction and development under extended photoperiod in medicinal cannabis

Wannida Sae-Tang[1], Jesus Marin Gomez[1], Carlos Contrera Aviles[1], Donis Bernal Cortes[1], Wouter Mooij[1], Hein Groen[1], Céline C.S. Nicole[2], Sabrina Carvalho[2], Iris F. Kappers, Ep Heuvelink[1], Leo Marcelis[1]
[1]Wageningen University and Research, Netherlands
[2]Signify Research, Netherlands

OS19-09

Evaluation of Alternative Soilless Growing Systems for Resource Use Efficiency, Yield and Quality Performance of Multi-leaf Lettuce

Pradip Poudel, Francesco Di Gioia
The Pennsylvania State University, United States of America

10:00-11:40 ORAL SESSION 20 / Organic Greenhouse Horticulture:
Soil fertility and plant health
Chair: Y. Zheng

OS20-01

Organic fertilizers: as priming agents for enhanced plant defences against pathogens?

Adam Barrada[1], Robab Mahmoudi[2], Noémie Rochon[2], Thy Thui An Nguyen[2], Martine Dorais[2]
[1]Aix Marseille University, Canada
[2]Laval University, Canada

OS20-02

Black soldier fly frass: a new organic fertilizer or biostimulant?

Robab Mahmoudi, Adam Barrada, Thi Thuy An Nguyen, Grant Vandenberg, Martine Dorais
Laval University, Canada

OS20-03

Analysis of Nutrient Composition of Organic Liquid Fertilizer for Optimizing Fertilizer Dosing for Hydroponic Crop Production

Uttara Samarakoon[1], Milon Chowdhury[1], James Altland[2], Hunter Myers[1], Leslie Taylor[1]
[1]Ohio State University, United States of America
[2]USDA, United States of America

OS20-04

The effect of organic liquid fertilizer treatment on growth and yield of Bean (*Phaseolus vulgaris*) grown in soilless culture in greenhouse

Ozlem Altuntas, Rabia Kucuk
Malatya Turgut Ozal University, Turkey

12:00–13:20 ORAL SESSION 20 / Organic Greenhouse Horticulture: Soil fertility and plant health

OS20-05

Feasibility study on application of organic liquid fertilizer in hydroponic water spinach (*Ipomoea aquatics* Forssk.)

Tomoka Endoh[1], Takumi Shimada[2], Jiaxun Hu[2], Na Lu[1], Michiko Takagaki[1]
[1]Chiba University, Japan
[2]Planet Co. Ltd., Japan

OS20-06

Evaluating the influence of organic fertilizers on container-grown highbush blueberries in high tunnels

Ève-Marie Boudreau-Forgues, Linda Gaudreau, Annie Brégard, André Gosselin, Laura Thériault
Laval University, Canada

OS20-07

Lettuce (*Lactuca sativa* L. var. Lalique) Production Using Organic Nutrient Solution Under Hydroponics System

Erecson Solis
Camiguin Polytechnic State College, Philippines

OS20-08

Valorization of greenhouse crop residues using anaerobic digestion

Marianne Belley, Martine Dorais
Laval University, Canada

15:00–17:00 ORAL SESSION 21 / Energy in greenhouses
Chair: R. Salazar-Moreno

OS21-01
Quantifying energy saving by screens – the role of humidity transport
Silke Hemming, Feije de Zwart, Vida Mohammadkhani, Marcel Raaphorst
Wageningen University & Research, Netherlands

OS21-02
The trade-off between yield and electricity use for sweet pepper production in closed greenhouses in arid environments
Ilias Tsafaras[1], Jouke Campen[1], Feije de Zwart[1], Wim Voogt[1], Hessel van der Heide[1], Muien Qaryouti[2], Mohamed Ewis Abdelaziz[2]
[1]Wageningen University & Research, Netherlands
[2]The National Research and Development Center for Sustainable Agriculture (Estidamah), Saudi Arabia

OS21-03
Analysis of greenhouse energy consumption in northern China
Yi Zhang, Chao Wang
IEDA, China

OS21-04
Development and demonstration of a net zero energy greenhouse (ZEG) for contributes to the decarbonization of horticulture
Masahisa Ishii[1], Soma Sugano[2], Yuta Ohashi[1], Ryota Tsuchiya[1], Takashi Miki[1], Keita Yoshinaga[3], Takayuki Tsukamoto[3], Hisao Okumura[4], Tomoko Shimizu[4], Yasumasa Hayashi[5], Kuninori Suzuki[6], Hiroyuki Watanabe[7], Makoto Nakaune[8], Eiji Goto[9], Hiroaki Nishi[10], Shin-ichi Tanabe[2]
[1]Institute for Rural Engineering, National Agriculture and Food Research Organization, Japan
[2]Waseda University, Japan
[3]Institute of Agricultural Machinery, National Agriculture and Food Research Organization, Japan
[4]Toyobo Co., Ltd., Japan
[5]The Holt Group LLC, Japan
[6]Inochio Group, Japan
[7]Kokubunji Orchids Co., Ltd., Japan
[8]Saitama Agricultural Technology Research Center Horticultural Research Institute, Japan
[9]Graduate School of Horticulture, Chiba University, Japan
[10]Department of System Design Engineering, Keio University, Japan

OS21-05

Assessment of the solar radiation and microclimate distribution inside a prototypal dynamic photovoltaic greenhouse equipped with solar tracker: An experimental and CFD assisted study

Reda Errais[1], Younes El Fellah[1], Allal Senhaji[2], Wissal Bozalmat[1]
[1]Institut Agronomique et Vétérinaire Hassan II, Morocco
[2]l'Ecole Nationale Superieure d'Arts et Metiers ENSAM-MEKNES, Morocco

OS21-06

Energy savings in greenhouses by the use of low emissivity materials in screens

David Katzin, Cecilia Stanghellini, Vida Mohammadkhani, Silke Hemming
Wageningen University & Research, Netherlands

15:00–17:00 ORAL SESSION 22 / Environmental impact and sustainable production

Chair: N. Gruda

OS22-01

Circular economy – transferring biological control principles into intensive production systems – the zero waste approach

Christian Ulrichs, Dennis Dannehl, Uwe Schmidt, Zoltan Ferenczi, Sophia Tadesse, Inga Mewis
Humboldt University Berlin, Germany

OS22-02

Model-based optimization of N-fertilization strategies, balancing production and nitrate leaching in horticultural crops

Eddie Schrevens[1], Jérémie Haumont[2], Jan Diels[1], Peter Lootens[2], Tim De Cuypere[3], Onno Bes[4], Jonas Bodyn[5], Wouter Saeys[1]
[1]Katholieke Universiteit Leuven, Belgium
[2]ILVO, Belgium
[3]INAGRO, Belgium
[4]Proefstation voor de Groenteteelt (PSKW), Belgium
[5]Provinciaal Proefcentrum voor de Groenteteelt Oost-Vlaanderen (PCG), Belgium

OS22-03

Implementation of the circular economy concept in greenhouse production systems: microalgae and biofertiliser production using soilless crops' drainage nutrient solution

Nikolaos Katsoulas[1], Sofia Faliagka[1], George Kountrias[1], Eleftheria Pechlivani[2]
[1]University of Thessaly, Greece
[2]Centre for Research and Technology Hellas, Information Technologies Institute, Greece

OS22-04
Electric fields influence lettuce plant growth and mineral uptake
Dahae Kim, Tae In Ahn
Seoul National University, Korea (Republic of)

OS22-05
AI-Based Detection of Plant Stress: A Case Study on Fir Trees Under Bark Beetle Attack
Claudia Probst, Georg Schneider
University of Applied Science Upper Austria, School of Engineering, Austria

15:00–17:00 ORAL SESSION 23 / Lighting technology III
Chair: E. Olvera

OS23-01
Intra-canopy lighting in tomato and cucumber crops
Leo F. M. Marcelis, Tijmen Kerstens, Britt Besemer, Ep Heuvelink
Wageningen University & Research, Netherlands

OS23-02
Effect of light intensity and air temperature on morphology, specialized metabolism, and photosynthesis of medical cannabis (*Cannabis sativa* L.)
Mexximiliaan Holweg, Aurora Cravino, Thomas J. Curren, Ep Heuvelink, Leo F.M. Marcelis
Wageningen University and Research, Netherlands

OS23-03
Interactions between photon spectra and temperature in lettuce and basil grown under sole-source lighting
Jiyong Shin, Erik Runkle
Michigan State University, United States of America

OS23-04
The effect of photoperiod and light spectra on greenhouse eggplant production
Jason Lanoue[1], Daniel Terlizzese[2], Celeste Little[1], Sarah St. Louis[1], Youbin Zheng[2], Xiuming Hao[1]
[1]Harrow Research and Development Centre, Canada
[2]University of Guelph, Canada

OS23-05

Evaluations of Dim Nighttime Blue Lighting and Downward Airflow to Manage Tipburn in Indoor Farm Lettuce

John Ertle, Chieri Kubota
The Ohio State University, United States of America

OS23-06

Effects of different supplemental lighting directions and intensities on leaf photosynthetic characteristics and fruit yield of strawberry (*Fragaria×ananassa*)

Fang Wang, Qiuhong Liao, Qingming Li, Qichang Yang
The Graduate School of Chinese Academy of Agricultural Sciences, China

OS23-07

Response of greenhouse tomato to continuous LED lighting varies with lighting placement

Xiuming Hao, Jason Lanoue, Celeste Little, Sarah St. Louis
Harrow Research and Development Centre, Canada

15:00–17:00 ORAL SESSION 24 / Greenhouse crops management

Chair: I. L. López-Cruz

OS24-01

Effects of vertical air velocity on growth, morphology, and acclimatization of tomato seedlings

Ricardo Hernandez[1], Brandon Huber[2]
[1]North Carolina State University, United States of America
[2]South Carolina State University, United States of America

OS24-02

Study on the mechanism of different soil-rotation irrigation with brackish and fresh water coordinately regulate cucumber development

Yune Cao, Yanfeng Wei, Wenhui Li
Ningxia University, Helan Mountain, China

OS24-03

Pre-harvest Nitrogen Limitation and Continuous Lighting Improve the Quality and Flavor of Lettuce (*Lactuca sativa* L.) under Hydroponic Conditions in Greenhouse

Xiao Yang, Jiangtao Hu, Zheng Wang, Tao Huang, Li Zhang, Jie Peng, Bo Song, Yuejian Li, Qichang Yang
Chinese Academy of Agricultural Sciences (CAAS), China

OS24-04

Can extreme light diffusion still increase crop growth in greenhouses?

Nieves Garcia Victoria[1], Esteban Baeza Romero[2], Bram Van Breugel[1], Cecilia Stanghellini[1], Silke Hemming[1]
[1]Wageningen University & Research, Netherlands
[2]Future Farms Solutions, University of Almería Spain

OS24-05

UVA1 radiation induced a rapid "leaf-blade flattening" response and promoted growth of tomato plants

Tao Li, Yating Zhang
Chinese Academy of Agricultural Sciences, China

OS24-06

Implementation of wind-solar hybrid systems in solar dryers through a mathematical model and the analysis of the ventilation rate

Eduardo Ríos Urbán, Elisa Sánchez Cruces, Eugenio Romantchik Kriuchkova, Alexis U. Chavez Rivera
Universidad Autónoma Chapingo, México

PS3: Poster presentations: Wednesday October 25, 2023

PS03-01 [Computational Fluid Dynamics]

Performance of a home plants factory (easy) for indoor lettuce production using computational fluid dynamics

Jorge Flores-Velazquez[1], Ernesto Aguilar[2], Candido Mendoza[1], Francisco Garcia[1]
[1]Colegio de Postgraduados, México
[2]Tecnológico Nacional de México Campus Los Reyes, México

PS03-02 [Computational Fluid Dynamics]

Implementation of ventilation towers in a greenhouse at the end of a slope: Numerical approach to natural ventilation behavior

Cruz Ernesto Aguilar Rodríguez[1], Jorge Flores Velázquez[2], Gamaliel Valdivia Rojas[1], Oscar Eduardo Aguilar Rodriguez[1], Eligio Flores Rodríguez[1], Rodrigo Morfin Magaña[1]
[1]Tecnológico Nacional de México Campus Los Reyes, México
[2]Colegio de Postgraduados, México

PS03-03 [Energy & environment]

Cross-laminated timber wall design and energy consumption analysis

Hyun Mi Cho, Dae-Hee Jang, KiUhn Ahn, Yo-Sun Yun, Taeh-Young Kim, Chaeyoung Bae, Chang U Chae
Korea Institute of Civil Engineering and Building Technology, Korea (Republic of)

PS03-04 [Energy & environment]

Proposal of revitalization plan through analysis of building greening technology trend and policy status in Korea

Dae-Hee Jang, Yo-Sun Yun, Hyun Mi Cho, Chang U Chae, KiUhn Ahn, Taeh-Young Kim
Korea Institute of Civil Engineering and Building Technology, Korea

PS03-05 [Computational Fluid Dynamics]

Thermal behavior and leaf temperature in high pressure sodium lamp supplemented greenhouse

Seungri Yoon[1], Jin Hyun Kim[1], Minju Shin[1], Dongpil Kim[1], Ho Jeong Jeong[1], Tae In Ahn[2]
[1] National Institute of Horticultural and Herbal Science, Korea (Republic of)
[2] Seoul National University, Korea (Republic of)

PS03-06 [Energy & environment]

Development of green building certification system for sustainable building-integrated greenhouse

Yosun Yun, Daehee Jang, Hyunmi Cho, Changu Chae
Korea Institute of Civil Engineering and Building Technology, Korea (Republic of)

PS03-07 [Covering materials]

The performance of semi-transparent photovoltaics in the field of greenhouse systems

Ioannis Lycoskoufis[1], Angeliki Kavga[2], Theororos Petrakis[2]
[1]Department of Agriculture, University of Peloponnese, Greece
[2]Department of Agricultural Science, University of Patras, Greece

PS03-08 [Energy & environment]

Analysis of Energy Load for Semi-closed Greenhouse with Hydrogen Fuel Cell Technology Based Trigeneration System using BES

Rack-woo Kim, Seung-hun Lee, Woo-ju kim, Jun-seop Mun, Chan-min Kim, Hee-woong Seok, Su-been Ahn, Sun-hyoung Lee, Jeong-hwan Park
Department of SmartFarm Engineering, Kongju National University, Korea (Republic of)

PS03-09 [Covering materials]

Optimized sunlight use in greenhouses with Agri-Photovoltaic

Daniel Tran, Sandra Anselmo, Robert Farinet, Cédric Camps
Agroscope, Switzerland

PS03-10 [Computational Fluid Dynamics]

Analysis of High-temperature Air Environment of Wide Span Type & Semi-closed Greenhouses

Rack-woo Kim, Seung-hun Lee, Woo-ju Kim, Jun-seop Mun, Chan-min Kim, Hee-woong Seok, Su-been Ahn, Sun-hyoung Lee, Jeong-hwan Park
Department of SmartFarm Engineering, Kongju National University, Korea (Republic of)

PS03-11 [Computational Fluid Dynamics]

CFD analysis of environmental uniformity in seedling factories

Mil Oh, IlHwan Seo
Jeonbuk National University, Korea (Republic of)

PS03-12 [Energy & environment]

Greenhouse vegetable production from the point of view of climate change

Nazim Gruda
University of Bonn, INRES Horticultural Sciences, Germany

PS03-13 [Computational Fluid Dynamics]

CFD analysis of the effect of external obstructions on the natural ventilation of greenhouses

Cruz Ernesto Aguilar Rodríguez[1], Jorge Flores Velázquez[2], Juan Carlos Martínez Jiménez[3], Eduardo Pulido Toro[1]
[1]Tecnológico Nacional de México Campus Los Reyes, México
[2]Colegio de Postgraduados, México
[3]Universidad Juárez Autónoma de Tabasco, México

PS03-14 [Energy & environment]

Impact of a rooftop greenhouse on building cooling and heating energy of a commercial building using building energy simulation (BES) model

Eunjung Choi, Jaehyun Kim, Sang Min Lee
Korea Institute of Machinery & Materials, Korea (Republic of)

PS03-15 [Energy & environment]

Analysis of odor patterns in swine manure according to feed type

Woo Je Lee, Won Choi, Ki Youn Kim
Seoul National University of Science and Technology, Korea (Republic of)

PS03–16 [Energy & environment]

Evaluation of the effectiveness of disinfectants to reduce bacteria – focusing on meat processing

Doo young Kim, Ki Youn Kim, Woo Je Lee
Seoul National University of Science & Technology, Korea (Republic of)

PS03–17 [Growing media]

Effects of nutrient media and temperature on botrytis cinerea pers. Variability

Neringa Rasiukeviciute, Alma Valiuskaite, Kristina Buneviciene, Viktorija Vastakaite-Kairiene
Lithuanian Research Centre for Agriculture and Forestry, Lithuania

PS03–18 [Covering materials]

Effect of a high transmittance film cover on agronomic and microclimatic plant parameters in a greenhouse tomato crop

María Angeles Moreno-Teruel[1], Francisco D. Molina-Aiz[2], Diego L. Valera[2], Alejandro López-Martínez[2], Fatima Baptista[1]
[1]Universidade de Évora, Portugal
[2]Universidad de Almería, Spain

PS03–19 [Energy & environment]

The energy balance in a mezcal process by analyzing the cooking system of "Pinia"

Raquel Salazar Moreno[1], Abraham Rojano Aguilar[1], Luis Miranda Trujillo[2]
[1]Universidad Autónoma Chapingo, México
[2]Universidad Humboldt de Berlín, Berlin, Germany

PS03–20 [Crop Management]

Biostimulants and inductors for the control of some stress variables in tomato (*Solanum lycopersicum* Mill)

Domingo Montalvo-Hernández, Karina Bruno-Armengolt, Armando Ramírez-Arias, Joel Pineda-Pineda
Universidad Autónoma Chapingo, México

PS03–21 [Energy & environment]

A Sustainable Greenhouse Business Model – A Way to Transform the agricultural landscape of Central Europe

Sandra Mühlböck
International Summer Academy in Engineering for Women, Austria

PS03-22 [Organic greenhouse horticulture]

Influence of Silicon application on the agronomic and nutritional performance on container grown highbush blueberries

Martine Dorais, Ève-Marie Boudreau-Forgues, Linda Gaudreau, Annie Brégard, André Gosselin, Laura Thériault
Laval University, Canada

PS03-23 [Organic greenhouse horticulture]

Optimizing Nitrogen Availability for Organic Greenhouse Cultures: A Study on Various Organic Fertilizers and Growing Media

Martine Dorais, Philippe Vézina, Thi Thuy An Nguyen, Adam Barrada, Annie Brégard, Jacynthe Dessureault-Rompré
Laval University, Canada

PS03-24 [Organic greenhouse horticulture]

Optimizing electrical conductivity level improves plant growth and secondary metabolites of *Cannabis sativa* L.

Juhyung Shin, Seungyong Ham, Jongseok Park
Chungnam National University, Korea (Republic of)

PS03-25 [Organic greenhouse horticulture]

Nitrogen mineralization from organic fertilizers and water and oxygen content in growing media: How are they related?

Laura Thériault, Steeve Pepin, Martine Dorais
Laval University, Canada

PS03-26 [Organic greenhouse horticulture]

Assessment of two natural biostimulants for the production of organic vegetable seedlings in greenhouses

Dan Ioan Avasiloaiei, Silvica Ambarus, Petre Marian Brezeanu, Creola Brezeanu, Mariana Calara
Stațiunea De Cercetare-Dezvoltare Pentru Legumicultură Bacău, Rumania

PS03-27 [Organic greenhouse horticulture]

Effect of humic acids on the tomato production in soilless media

Marco A. Bustamante[1], Alejandro José Bustamante Dávila
[1]Universidad Autónoma Agraria Antonio Narro, México
[2]Wageningen University and Research, Netherlands

PS03-28 [Organic greenhouse horticulture]

Assessment of biofumigation with mustard or canola residues for controlling Rhizoctonia solani in greenhouse-grown cucumbers

An Thi Thuy Nguyen, Martine Dorais
Laval University, Canada

PS03-29 [Lighting technology]

Effects of light spectrum on inflorescence development and specialized metabolism, at different light intensities in medical cannabis

Mexximiliaan Holweg, Luc L.W. Rademakers, Beertje Douven, Leo F.M. Marcelis
Wageningen University & Research, Netherlands

PS03-30 [Crop Management]

Investigations of auxins transport in Petunia hybrida caused by thigmomorphogenesis

Agata Jedrzejuk[1], Margrethe Serek[2]
[1]Warsaw University of Life Science, Poland
[2]Leibniz University of Hannover, Germany

PS03-31 [Computational Fluid Dynamics]

Analysis of Thermal Energy Loads of a Building-integrated Rooftop Greenhouse (BiRTG) for Urban Agriculture

Uk-Hyeon Yeo[1], In-bok Lee[2]
[1]Gyeongsang National University, Korea (Republic of)
[2]Seoul National University, Korea (Republic of)

PS03-32 [Organic greenhouse horticulture]

Choosing light for a perfect date? Light spectra have different impacts on mating and developmental performances of the generalist beneficial Orius insidiosus (Say)

Morgane Canovas[1], Jean-François Cormier[2], Tigran Galstian[1], Paul Abram[3], Martine Dorais[1]
[1]Laval University, Canada
[2]Institut National d'Optique, Canada
[3]Agassiz Research and Development Centre, Agriculture and Agrifood, Canada.