

WELCOME MESSAGE

Dear colleagues,

The GreenSys 2017 (International Symposium on New Technologies for Environment Control, Energy-saving and Crop Production in Greenhouse and Plant Factory) will be held in Beijing, China from 20th to 24th August 2017. It is our pleasure to host this conference and we would like to invite you to join.

This event is a great opportunity to bring together researchers, technicians, academics, and other professionals in greenhouse horticulture and plant factory area to share knowledge and ideas, as well as discuss the state of the art and future perspectives for the greenhouse horticulture and plant factory sector.

Beijing is the capital of China, it is an ancient city with more than 3000 years' history. There are many historical places such as the Forbidden city, Summer Palace, Great wall and Temple of Heaven etc, which attract tourist from all over the world. Beijing is also a modernized city where skyscrapers and shopping malls everywhere. Furthermore, Beijing is characterized by its' cultural spirits of openness, innovation, inclusiveness, and people are extremely friendly and known by their hospitality.

We believe that you will make the most of your stay in Beijing, from the scientific sessions to the cultural and touristic programs that we will prepare for you!

We expect to see you all in GreenSys 2017 in Beijing!

Co-Conveners

Qichang Yang (IEDA, CAAS)

Weijie Jiang (IVF, CAAS)

Weihong Luo (Nanjing Agricultural Univ)



ORGANIZING COMMITTEE

Conveners:

Qichang Yang (IEDA, CAAS)

Weijie Jiang (IVF, CAAS)

Weihong Luo (Nanjing Agricultural Univ.)

Committee Members:

Qichang Yang (CAAS)

Weijie Jiang (CAAS)

Weihong Luo (Nanjing Agricultural University)

Wenke Liu (CAAS)

Yukun Liu (CAAS)

Ruifeng Cheng (CAAS)

Yuxin Tong (CAAS)

Yi zhang (CAAS)

Kun Li (CAAS)

Hui Fang (CAAS)

Tao Li (CAAS) (Secretary)

Working Groups:

ISHS Commission Protected Cultivation

ISHS Commission Horticultural Engineering

ISHS Workgroup Vegetable Grafting

ISHS Workgroup Organic Greenhouse Horticulture

ISHS Workgroup Protected Cultivation in Mild Winter Climates

ISHS Workgroup Nettings in Horticulture (subgroup of Protected Cultivation in Mild Winter Climates)

ISHS Workgroup Light in Horticulture

ISHS Workgroup Modelling Plant Growth, Environmental Control, Greenhouse Environment

ISHS Workgroup Computational Fluid Dynamics

SCIENTIFIC COMMITTEE

NAME	AFFILIATION	NATIONALITY
André Gosselin	Université Laval	Canada
Carl-Otto Ottosen	Aarhus University	Denmark
Cecilia Stanghellini	Wageningen UR Greenhouse Horticulture	Netherlands
Changji Zhou	Chinese Academy of Agricultural Engineering	China
Chungui Lu	Nottingham Trent University	UK
Constantinos Kittas	University of Thessaly	Greece
Danfeng Huang	Shanghai Jiaotong University	China
Eiji Goto	Chiba University	Japan
Eldert Van Henten	Wageningen University	Netherlands
Elias Kaiser	Wageningen UR Greenhouse Horticulture	Netherlands
Ep Heuvelink	Wageningen University	Netherlands
Erik Runkle	Michigan State University	USA
Esteban Baeza	Wageningen UR Greenhouse Horticulture	Netherlands
Fátima Baptista	University of Évora / ICAAM	Portugal
Francisco Domingo Molina-Aiz	University of Almería	Spain
Frank Kempkes	Wageningen UR Greenhouse Horticulture	Netherlands
Gene Giacomelli	University of Arizona	USA
Gerard P.A. Bot	Wageningen University	Netherlands
Hao Liang	Beijing Academy of Agriculture and Forestry Science.	China
Hiroshi Shimizu	Kyoto University	Japan
Hyun Woo Lee	Kyungpook National University	Republic of Korea
Ido Seginer	Technion	Israel
In-Bok Lee	Seoul National University	Republic of Korea
Irineo L. Lopez-Cruz	University of Chapingo	Mexico
Jingquan Yu	Zhejiang University	China
Joaquim Miguel Rangelc.Costa	LEM-ITQB-Univ.Nova de Lisboa & LEAF-ISA-U. Lisboa	Portugal
Josef Tanny	Agricultural Research Organization	Israel
Juan Montero	Institut de Recerca i Tecnologia Agroalimentaries	Spain
Jung Eek Son	Seoul National University	Republic of Korea
Katrin Kahlen	Geisenheim University	Germany
Kazuhiro Fujiwara	The University of Tokyo	Japan
Leo Marcelis	Wageningen University	Netherlands
Marie-Christine Van Labeke	Ghent University	Belgium
Martine Dorais	Agriculture and Agri-Food Canada /Laval University	Canada



Meir Teitel	ARO, Volcani Center	Israel
Murat Kacira	The University of Arizona	USA
Myung-Min Oh	Chungbuk National University	Republic of Korea
Nadia Bertin	INRA	France
Nazim Gruda	University of Bonn	Germany
Nicolas Castilla	IFAPA	Spain
Nikolaos Katsoulas	University of Thessaly	Greece
Oliver Körner	Danish Technological Institute	Denmark
Pierre-Emmanuel Bournet	Agrocampus Ouest	France
Qichang Yang	Chinese Academy of Agricultural Sciences	China
Qingyun Chen	China Agricultural University	China
Roberta Paradiso	University of Naples Federico II	Italy
Roberto Lopez	Michigan State University	USA
Rodney Thompson	University of Almeria	Spain
Ryo Matsuda	The University of Tokyo	Japan
Sang-Woon Nam	Chungnam National University	Republic of Korea
Sasan Ali niaei fard	University of Tehran	Iran
Shirong Guo	Nanjing Agricultural University	China
Silke Hemming	Wageningen UR Greenhouse Horticulture	Netherlands
Sissel Torre	Norwegian University of Life Sciences	Norway
Stefania De Pascale	University of Naples Federico II	Italy
Susana M.P. Carvalho	University of Porto	Portugal
Tadahisa Higashide	National Agriculture and Food Research Organization	Japan
Tao Li	Chinese Academy of Agricultural Sciences	China
Thomas Bartzanas	Center for Research& Technology-Hellas	Greece
Tianlai Li	Shenyang Agricultural University	China
Toyoki Kozai	Japan Plant Factory Association	Japan
Wei Fang	National Taiwan University	Chinese Taipei
Weihong Luo	Nanjing Agricultural University	China
Weijie Jiang	Chinese Academy of Agricultural Sciences	China
Weitang Song	China Agricultural University	China
Xiuming Hao	Agriculture and Agri-Food Canada	Canada
Yaling Li	Shanxi Agricultural University	China
Youbin Zheng	University of Guelph	Canada
Yuksel Tuzel	Ege University	Turkey
Yuxin Tong	Chinese Academy of Agricultural Sciences	China
Zhilong Bie	Huazhong Agriculture University	China
Zhirong Zou	Northwest A&F University	China

KEYNOTE SPEAKERS



KEYNOTE SPEECH I Prof. Dr. Leo Marcelis

Head of the chair group Horticulture and Product Physiology, Wageningen University, Wageningen, The Netherlands

Title: Sustainable crop production in greenhouses based on crop physiological understanding

His research combines experimentation and simulation. It focuses on physiology, growth and product formation of plants and plant organs in order to improve sustainability and quality of crop production in controlled environments such as greenhouses or city farms. In particular fluxes of assimilates, water and nutrients in the plant, sink/source interactions and partitioning among plant organs in response to abiotic constraints are subject of study. He has published over 130 scientific papers (H-index 33 in google scholar) and over 200 papers in professional journals.



KEYNOTE SPEECH II Dr. Juan I. Montero

Research director of the Environmental Horticulture Programme at IRTA Research Institute, Barcelona, Spain.

Title: Innovative systems for sustainable greenhouse production

His major research field is greenhouse technology with special focus on Mediterranean climates: physical modelling of the greenhouse climate, development of energy balance models, computational fluid dynamics studies, greenhouse covering materials, development of new greenhouse prototypes and so on. One of the articles he has co-authored received the Award of the European Society of Agricultural Engineering (EurAgEng) to the 2012-2013 best scientific article. He has been director and co-director of ten PhD dissertations. Currently he is co-directing two PhD dissertations on roof top greenhouses. He has also been a member of many scientific committees related to greenhouse horticulture.



KEYNOTE SPEECH III Prof. Dr. Toyoki Kozai

President of The Agricultural Academy of Japan, Japan

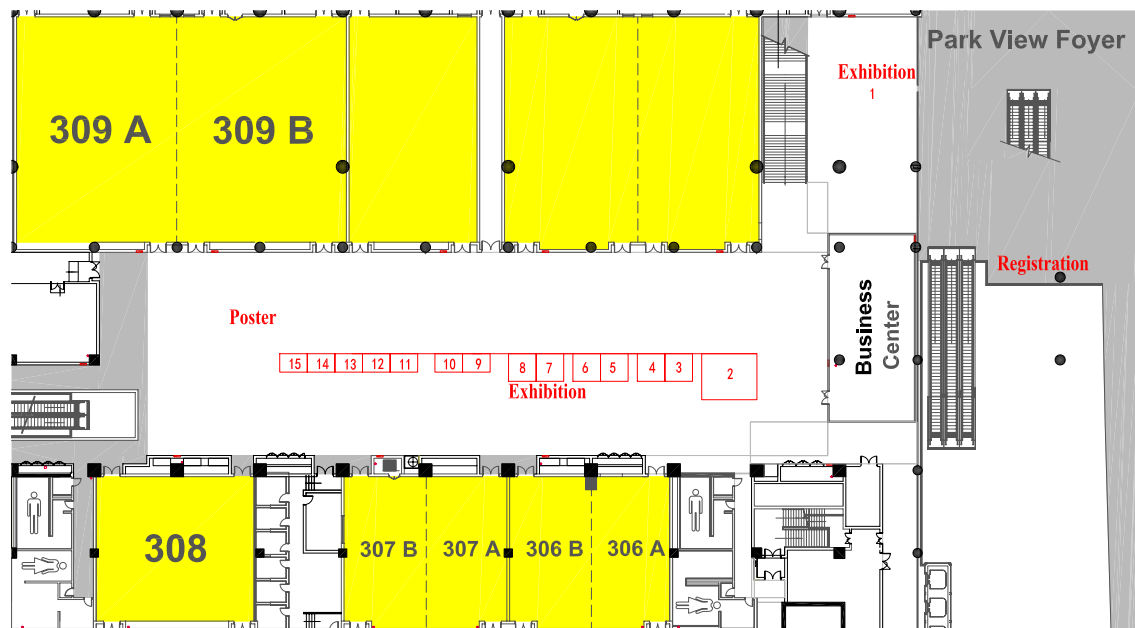
Title: Smart Plant Factories and Greenhouses: Will dreams Become Reality?

After establishing his early work on greenhouse light environments, energy savings, ventilation, computer applications, his scientific interest was extended to in vitro environments and their control for sugar-free medium micro-propagation and transplant production in closed systems with artificial lighting. Since 2010, he has been working as the president of Japan Plant Factory Association (non-profit organization) and is leading R & D of "plant factory with artificial lighting (PFAL)" and "greenhouse environment control" using heat pump, fogging, null-balance CO₂ enrichment and nutrient solution control systems. He has published more than 200 refereed papers and more than 50 book chapters. He wrote and edited more than 10 books, including "Plant Factory: an indoor vertical farming system for efficient quality food production published in October 2015 by Academic Press, and 'LED lighting for Urban Agriculture' to be published by Springer in October 2016.

PROGRAM AT A GLANCE

Date/ Hour	Aug.20 (Sun)	Aug.21(Mon)			Aug.22(Tue)			Aug.23(Wed)			Aug.24(Thu)	
8:00		Registration (8:00–18:00)			Registration (8:00–18:00)			Registration (8:00–18:00)				
8:30		Opening Ceremony (8:30–9:10, 309AB)			Keynote Speech II (8:30–9:10, 309AB)			Keynote Speech III (8:30–9:10, 309AB)				
9:00		Keynote Speech I (9:10–9:50, 309AB)			Group Photo with Coffee Break (9:10–9:50)			Poster Session with Coffee Break (9:10–10:00) P–09/P–10/P–11				
9:30												
10:00	Registration (10:00–18:00)	Coffee Break (9:50–10:10)			Oral Session (9:50–12:00)			Oral Session (10:00–12:00)			Post–Conference Tour	
10:30		Oral Session (10:10–12:10)										
11:00		O–01 Climate Control & Modeling I (307AB)	O–02 Crop Production & Management I (308)	O–03 Lighting Technology I (309AB)	O–10 Greenhouse System and Design I (307AB)	O–11 Plant Factory Technology I (308)	O–12 Crop Production & Management II (309AB)	O–17 Greenhouse System & Design II (307AB)	O–18 Plant Factory Technology II (308)	O–19 Climate Control & Modeling III (309AB)		
11:30												
12:00												
12:30		Lunch (12:10–13:40) Function Halls A&B			Lunch (12:00–13:30) Function Halls A&B			Lunch (12:00–13:30) Function Halls A&B				
13:00												
13:30					Oral Session (13:30–15:30)			Oral Session (13:30–15:00)				
14:00		Oral Session (13:40–15:40)										
14:30		O–04 Fertigation & Growing Medium Management I (306AB)	O–05 Product Quality I (307AB)	O–06 Crop Modeling (308)	O–13 Covering Materials (306AB)	O–14 Lighting Technology III (307AB)	Business Session for Sponsors (308)	O–20 Crop Production & Management III (306AB)	O–21 Plant Factory Technology III (307AB)	CFD Working Group Meeting (308)		
15:00								Closing Ceremony (15:00–15:30, 309AB)				
15:30												
16:00		Poster Session with Coffee Break (15:40–16:40) P–01/P–02/P–03/P–04/P–05			Poster Session with Coffee Break (15:30–16:30) P–06/P–07/P–08							
16:30					Oral Session (16:30–18:00)							
17:00		Oral Session (16:40–18:00)										
17:30		O–07 Fertigation & Growing Medium Management II (306AB)	O–08 Product Quality II (307AB)	O–09 Lighting Technology II (308)	O–15 Climate Control & Modeling II (306AB)	O–16 Lighting Technology IV (307AB)	Business Meeting for CMEN & CMPC; WG Meeting for Protected Cultivation in Mild Winter (308)					
18:00												
18:30		Welcome Reception (18:00–20:00)							Banquet Dinner at Badaling Hotel			
19:00												
19:30	Function Halls A&B											
20:00												

FLOOR PLAN AND EXHIBITION LAY-OUT



EXHIBITORS

Booth No.	Exhibitors
1	Megaphoton Inc
2	Beijing IEDA Protected Horticulture Tech.Co.,Ltd.
3	Richland Sources
4	Henan Yuhua New Material Co.,Ltd.
5	Japan Plant Factory Association
6	AEssense Technology (Shanghai) Ltd.
7	Dalian YiJiaTianYuan Environmental Tech.Co.,Ltd
8	USHIO SHANGHAI, INC.
9	Ridder (Shanghai) Agricultural Technology Co., Ltd
10	Beijing Ecotek Technology Tech.Co.Ltd.
11	Hoogendoorn Asia Co.,Ltd.
12	(Taiwan) NuPolar-Lights Bio-photosynthesis LED Group
13	Shanghai Dushi Green Engineering Co.,Ltd.
14	Beijing Kingpeng International Hi-Tech Corporation
15	Suzhou Delong Composite Material Co.,Ltd.

GENERAL INFORMATION

Languages:

The official language for the symposium is English. Simultaneous translation into Chinese or English is available for the Opening Ceremony and Business Session for Sponsors.

Registration & Information Desk:

All participants are required to check-in at the registration desk. Registered participant will receive a name badge and the symposium bag in which the Program & Abstract Book and other items will be provided.

Location: Foyer, 3rd floor

Open Hours:

20 August (Sunday), 10:00~18:00

21~23 August (Monday~Wednesday), 8:00~18:00

Registration Fee Covers:

General Participant/Student	Accompanying Person
Admission to all Scientific Sessions	Admission to Exhibition
Exhibition	Welcome Reception
Symposium Bag	Coffee Breaks and Lunches
Welcome Reception	
Coffee Breaks and Lunches	

Preview Room:

Oral presenters should check-in and preview their presentation files at preview room at least 12 hours before the session time.

Location: Preview room is nearby the registration desk.

Open Hours: 20 August (Sunday), 10:00~18:00

21~23 August (Monday~Wednesday), 8:00~18:00

Name Badge:

For security purpose, participants are kindly reminded to wear name badges at all times while attending symposium and social events. Entrance into sessions will be limited to badge holders only.

Internet:

Free internet will be available in CNCC, WiFi code will be announced nearby the registration desk.

OFFICIAL/SOCIAL PROGRAMS

Welcome Reception

All registered participants and accompanying persons are invited to attend the Welcome Reception. Food and drinks will be served with 20~30 min performance of Chinese Traditional Music Instrument Band.

Location: Function Halls A&B, 1st floor

Date & Time: 20 August (Sunday), 18:00-20:00

Opening Ceremony

All registered participants are invited to attend the Opening Ceremony.

Location: 309 AB, 3rd floor

Date & Time: 21 August (Monday), 8:30-9:10

Closing Ceremony

All registered participants are invited to attend the Closing Ceremony.

Location: 309 AB, 3rd floor

Date & Time: 23 August (Wednesday), 15:00-15:30

Banquet Dinner

The Banquet Dinner is scheduled on Wednesday evening, August 23. It will be held in the premise of Badaling Hotel just nearby the Great Wall. Shuttle buses run from China National Convention Center (CNCC) after the end of day programs. There is about 1.5hrs drive to Badaling Great Wall, a short tour on the Wall is recommended before the banquet commences. Guests could have free drinks on the 3rd floor terrace while enjoying the Great Wall view. Dinner will be at the 2nd floor. After the dinner, guests will be transferred back by shuttle bus to CNCC. The cost to participate in the banquet dinner is 530 CNY.

Banquet Schedule	
16:00	Transfer to Badaling Great Wall
17:30	Climb the Great Wall
18:45	Pre-dinner Drink at Badaling Hotel Restaurant
19:00	Banquet at Badaling Hotel Restaurant
20:30	Depart for CNCC

Lunches

Buffet lunch will be provided for 3 days from 21~23 August.

Location: Function Halls A&B, 1st floor

Date & Time: 21 August, 12:10~13:40 / 22~23 August, 12:00~13:00

Coffee Breaks

Coffee and tea will be served to all participants.

Location: Exhibition area, 3rd floor

Date & Time:

21 August, 9:50~10:10 / 15:40~16:40 with poster presentation

22 August, 9:10~9:50 with group photo/15:30~16:30 with poster presentation

23 August, 9:10~10:00 with poster presentation

Group Photo

A commemorative group photo will take place at the hall in the first floor of CNCC.

Date & Time: 22 August, 9:10~9:50 with Coffee Breaks

Tour Programs

The participants who wish to join the post-conference tour should confirm their attendance at the registration desk before 18:00, 21 August. Upon confirming your attendance at the desk, you will get detailed information about the tour.

Date & Time: 24 August (Thursday), 8:00~18:00

Tour Fee: 600 CNY

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



PRESENTATION GUIDELINES

Guidelines for Oral Presenters

Presentations using Microsoft PowerPoint are strongly recommended, ensuring they display well on a Windows-operating computer. Embedded files (such as videos) and sounds are discouraged unless arranged in advance with the secretary. Please bring your presentation file with USB memory stick to preview room at least 12 hours before your presentation time, and include your full name in the file name.

Location: Preview room is nearby the registration desk.

Open Hours:

20 August (Sunday), 10:00~18:00

21~23 August (Monday~Wednesday), 8:00~18:00

Please arrive at the presentation room 15 minutes before your session in order to check if anything would change and discuss with the session chair. Please bring your USB memory stick with you to the presentation room as a backup in case of emergency.

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

Presentation time: Depending on the type of presentation being giving, speakers are allocated different amounts of time for their talk. The length of time per speaker including questions and discussions.

Presentation Type	Length of Time per Speaker
Keynote Presentation	40 min
Invited Presentation	25 min
General Presentation	18 min

Guidelines for Poster Presenters

Posters should be less than 95cm (width) × 130cm (length) in size and can be affixed to the panels using poster glue which will be available on the poster exhibition area.

Posting Schedule:

Set-up-20 August (Sunday), 13:00~18:00

Removing -23 August (Wednesday), 13:00~15:00

Poster Presentations:

(1) 21 August (Monday), 15:40~16:40/(P-01~P-05)

(2) 22 August (Tuesday), 15:30~16:30/(P-06~P-08)

(3) 23 August (Wednesday), 9:10~10:00/(P-09~P-11)

Note: All presenters should be in front of their own poster during the presentation time.

GREENSYS2017

August 20-24, 2017 Beijing China



GREENSYS2017

August 20-24, 2017 Beijing China

SCIENTIFIC PROGRAMS



Scientific Program

Aug.21(Mon)			
8:00	Registration (8:00-18:00)		
8:30	Opening Ceremony (8:30-9:10, 309AB) Welcome speech by minister of Agricultural Ministry & general director of CAAS Highlight presentation by academican Tianlai Li		
9:00	Keynote Speech I (9:10-9:50, 309AB) Speaker: Leo Marcelis Chair: Weihong Luo		
9:30	Coffee Break (9:50-10:10)		
10:00	Oral Session (10:10-12:10)		
10:30	O-01 Climate Control & Modeling (I) (307AB) Chair::Murat Kacira Invited:In-Bok Lee O-01-01:Pierre-Emmanuel Bournet O-01-02:Jouke Campen O-01-03:Rackwoo Kim O-01-04:Wei Lu O-01-05:Giuliano Vox	O-02 Crop Production & Management (I) (308) Chair:Stefania De Pascale Invited:Jung Eek Son O-02-01:Cecilia Stanghellini O-02-02:Kai Zhang O-02-03:Dália R.A.Carvalho O-02-04:Yaling Li O-02-05:Yuya Mochizuki	O-03 Lighting Technology (I) (309AB) Chair:Ep Heuvelink Invited:Xiuming Hao O-03-01:Ricardo Hernandez O-03-02:Sissel Torre O-03-03:Theoharis Ouzounis O-03-04:Chengyao Jiang O-03-05:Yujin Park
11:00			
11:30			
12:00			
12:30	Lunch (12:10-13:40, Function Halls A&B)		
13:00			
13:30			
14:00	O-04 Fertigation & Growing Medium Management (I) (306AB) Chair: Weijie Jiang Invited: Stefania De Pascale O-04-01:Etienne Chantoiseau O-04-02:Mojtaba Delshad O-04-03:Youbin Zheng O-04-04:Hailiang Zhao O-04-05:Xiao Yang	Oral Session (13:40-15:40) O-05 Product Quality (I) (307AB) Chair: Nazim Gruda Invited: Martine Dorais O-05-01:Celine C.S. Nicole O-05-02:Akvilė Viršilė O-05-03:Qianxixi Min O-05-04:Susana M.P. Carvalho	O-06 Crop Modeling (308) Chair: Tadahisa Higashide Invited: Ep Heuvelink O-06-01:Weihong Luo O-06-02:Irineo Lopez-Cruz O-06-03:Dae Ho Jung O-06-04:Doudou Guo
14:30			
15:00			
15:30			
16:00	Poster Session with Coffee Break (15:40-16:40) P-01/P-02/P-03/P-04/P-05		
16:30			
17:00	O-07 Fertigation & Growing Medium Management (II) (306AB) Chair:Danfeng Huang O-07-01:Tae In Ahn O-07-02:Martine Dorais O-07-03:Johanna Suhl O-07-04:Ligen Yu	Oral Session (16:40-18:00) O-08 Product Quality (II) (307AB) Chair:Susana M.P. Carvalho O-08-01:Maryam Seifi kalhor O-08-02:Dennis Dannehl O-08-03:Shivappa Mantur O-08-04:Sasan Aliniaiefard	O-09 Lighting Technology (II) (308) Chair:Eiji Goto O-09-01:Wataru Sugeno O-09-02:Dongxian He O-09-03:Hans Spalholz O-09-04:Jun wei Yang
17:30			
18:00			

Oral Presentations

9:10–9:50 Keynote Speech I

309AB

Chair: Weihong Luo

Sustainable Crop Production in Greenhouses Based on Crop Physiological Understanding

Leo F. M. Marcelis, Ep Heuvelink

Wageningen University, Horticulture and Product Physiology, The Netherlands

10:10–12:10 O-01. Climate Control & Modeling (I)

307AB

Chair: Murat Kacira

Invited Speech

Future-Oriented Aerodynamic Application for Educating Protected Cultivation

In-Bok Lee

Department of Rural Systems Engineering, College of Agriculture and Life Sciences, Seoul National University, Korea

O-01-01

CFD Modelling of Crop-microclimate Interaction for Plants under Water Restriction inside a Greenhouse Compartment

Ali Hacene Bouhoun, Pierre-Emmanuel Bournet, Patrice Cannavo, Etienne Chantoiseau

Agrocampus Ouest, France

O-01-02

Climatisation of a Closed Greenhouse in the Middle East

Jouke Campen¹, Feije De Zwart¹, Al Hammadi Mohammed², Al Shrouf Ali¹, Dawoud Mohammed¹

¹*Wageningen University and Research, The Netherlands*

²*Abu Dhabi Food Control Authority, The United Arab Emirates*

³*Environment Agency Abu Dhabi, The United Arab Emirates*

O-01-03

Estimation on Wind Pressure Coefficient of Single-span Greenhouse Using LES Turbulence Model of CFD

Rackwoo Kim, Minhyung Lee, In-Bok Lee, Sangyeon Lee

Department of Rural Systems Engineering, College of Agriculture and Life Sciences, Seoul National University, Korea

O-01-04

Modelling and Experimental Verification of Thermal Performance of an Active Heat

Storage – Release System in the Chinese Solar Greenhouse

Wei Lu, Yi Zhang, Qichang Yang, Hui Fang, Xinglin Ke, Xiaoran Wei

Institute of Environment and Sustainable Development in Agriculture, Chinese Academy of Agricultural Sciences, China

O-01-05

Climate Control inside a Greenhouse by Means of a Solar Cooling System

Giovanni Puglisi¹, Giuliano Vox², Evelia Schettini², Gioacchino Morosinotto², Carlo Alberto Campiotti¹

¹ENEA - Italian National Agency for New Technologies, Energy and Sustainable Economic Development- Technical Unit Energy Efficiency, Italy

²Department of Agricultural and Environmental Science DISAAT, University of Bari, Italy

10:10–12:10 O-02. Crop Production & Management (I)

308

Chair: Stefania De Pascale

Invited Speech

Recent Research on Crop and Phytochemical Production in Greenhouse

J. E. Son, S. J. Lee, Z. Han, W. H. Kang, T. W. Moon

Department of Plant Science, Seoul National University, Korea

O-02-01

Resource Use of Vegetable Production in Deep Space: Determining Factors

Cecilia Stanghellini, Esther Meinen, Frank Kempkes, Tom Dueck

Wageningen University and Research, The Netherlands

O-02-02

The Calcium–Dependent Protein Kinase CPK1 Regulates Development by Influencing the Hormone Homeostasis in Woodland Strawberry

Kai Zhang^{1,2}, Jiayue Feng^{1,2}, Zhirong Zou^{1,2}

¹Northwest A&F University, China

²Key Laboratory of Protected Horticultural Engineering in Northwest, China

O-02-03

Moderate Salinity Increases Leaf Abscissic Acid Concentration Improving Stomatal Functioning in Roses Grown at High Relative Air Humidity

Dália R. A. Carvalho^{1,2}, Marta W. Vasconcelos², Susana M. P. Carvalho^{1,2,3}, Ep Heuvelink¹

¹Horticulture and Product Physiology group, Wageningen University and Research, The Netherlands

²CBQF–Centro de Biotecnologia e Química Fina – Laboratório Associado, Escola Superior de Biotecnologia, Universidade Católica Portuguesa/Porto, Portugal

³GreenUP/CITAB-UP & DGAOT, Faculty of Sciences, University of Porto, Portugal

O-02-04

Effect of Increasing Humidity on Flowering and Fruit-set and Pollen Characteristics of Tomato under Heat StressYaling Li, Shanshan Wang, Xiangzhen Wen*College of Horticulture, Shanxi Agricultural University, China*

O-02-05

Effect of Low Temperature and Solar Radiation on Dry Matter Production, Fruit Yield and Emergence of Malformed Fruit in Strawberry (*Fragaria x ananassa* Duch.)Yuya Mochizuki, Hiroki Umeda, Tetsuya Saito, Takeshi Saito, Tadahisa Higashide, Yasunaga Iwasaki*Institute of Vegetable and Floriculture Science, National Agriculture and Food Research Organization, Japan***10:10–12:10 O-03. Lighting Technology (I)****309AB****Chair: Ep Heuvelink**Invited Speech**Smart Application of Supplemental Lighting in Greenhouse Fruiting Vegetable Production**X. Hao¹, X. Guo¹, J. Lanoue^{1, 4}, Y. Zhang¹, R. Cao², J. Zheng¹, C. Little¹, Demos Leonardos⁴, S. Kholsa³, Bernard Grodzinski⁴, M. Yelton⁵¹*Harrow Research and Development Centre, Agriculture and Agri-Food Canada, Canada*²*Guelph Research and Development Centre, Agriculture and Agri-Food Canada, Canada*³*Ontario Ministry of Agriculture, Food and Rural Affairs, Canada*⁴*Department of Plant Agriculture, University of Guelph, Canada*⁵*LumiGrow, USA*

O-03-01

Morphology and Growth of Ornamental Seedlings Grown under Supplemental LED Lighting and Chemical Plant Growth RegulatorRicardo Hernandez, Cristian Collado, Brian E. Whipker*Department of Horticultural Sciences, North Carolina State University, USA*

O-03-02

The Aerial Environment Modulates Plants Response to Blue LightS. Innes, A. Niday, S. Jakobsen, S. Torre*Department of Plant Sciences, Norwegian University of Life Sciences, Norway*

O-03-03

The Effect of Adding Far-red Light to White or Red/Blue Supplemental LED Lighting on Growth and Development of Greenhouse Tomato Plants

Theoharis Ouzounis¹, Ep Heuvelink¹, Henk J. Schouten², Richard G. F. Visser², Leo F. M. Marcelis¹

¹*Horticulture and Product Physiology Group, Wageningen University, The Netherlands*

²*Plant Breeding, Wageningen University and Research, The Netherlands*

O-03-04

Effect of Supplemental Far-red Light with Blue and Red LEDs Lamps on Leaf Photosynthesis, Stomatal Regulation and Plant Development of Protective Cultivated Tomato

Chengyao Jiang¹, Masahumi Johkan¹, Toru Maruo¹, Masaaki Hohjo¹, Satoru Tsukagoshi¹, Mitsuru Ebihara², Akio Nakaminami²

¹*Graduate School of Horticulture, Chiba University, Japan*

²*Mitsubishi Plastic Agri Dream, Japan*

O-03-05

Investigating the Interaction between Photosynthetic Photon Flux Density and Far-red Radiation in Seedling Production under Sole-source Lighting

Y. Park, E. S. Runkle

Department of Horticulture, Michigan State University, USA

13:40–15:40 O–04. Fertigation & Growing Medium Management (I) 306AB

Chair: Weijie Jiang

Invited Speech

Sustainable Nutrient and Water Management of Greenhouse Horticultural Crops

S. De Pascale, Y. Roupheal

Department of Agricultural Sciences, University of Naples Federico II, Italy

O-04-01

Effects of a Set of Water Restrictions on Potted Ornamental Crops Grown in Greenhouses Influence on New Guinea Impatiens Quality

Etienne Chantoiseau, Ali Hacène Bouhoun, Pierre Emmanuel Bournet, Patrice Cannavo

EPHOR Research Unit, Agrocampus Ouest, France

O-04-02

The Possibility of Predicting Mixed Soilless Media Physical Properties Through Component's Characteristics

M. Delshad, H. Mazari Manghabi, A. K. Kashi

Department of Horticultural Science, University College of Agriculture and Natural Resources, University of Tehran, Iran

O-04-03

Current Nutrient Management Practices and Technologies Used in North American Greenhouse and Nursery IndustriesYoubin Zheng*School of Environmental Sciences, University of Guelph, Canada*

O-04-04

Melatonin Mitigates Chilling Stress in Cucumber Chloroplasts by Regulating Photosynthetic Electron Flux and the Ascorbate-glutathione CycleHailiang Zhao¹, Yaping Wang¹, Linjie Xi², Junwei Yang¹, Jie Yu¹, Tonghua Pan¹, Lu Liu¹, Kaiqi Ai¹, Dawei Xu¹, Zhirong Zou¹¹*Northwest A&F University, China*²*Gansu Agriculture Technology College, China*

O-04-05

Glycine Promoting Glycosylated Flavonoids Accumulation in Lettuce (*Lactuca sativa* L.) Using GC-MS and UPLC-IMS-QTOF-MSXiao Yang¹, Lei Feng², Li Zhao¹, Danfeng Huang¹¹*School of Agriculture and Biology, Shanghai Jiao Tong University, Key Laboratory of Urban Agriculture (South), Ministry of Agriculture, China*²*Instrumental Analysis Center, Shanghai Jiao Tong University, China***13:40–15:40 O-05. Product Quality (I)****307AB****Chair: Nazim Gruda**Invited Speech**Revisiting the Concept of Quality Improvement of Greenhouse Products**Martine Dorais*Plant Science Department, Envirotron bldg., Laval University, Canada*

O-05-01

Nitrate Control Using LED LightingCeline C. S. Nicole¹, Joris Huskens^{1,2}, Weifan Lu^{1,3}, Marcel P. C. M. Krijn¹¹*Philips Research Laboratories, The Netherlands*²*HAS, Hogeschool den Bosch, The Netherlands*³*Wageningen University Horticulture and Product Physiology, The Netherlands*

O-05-02

LED Lighting Parameters for Reduced Nitrate Contents in Green VegetablesAkvilė Viršilė, Aušra Brazaitytė, Sandra Sakalauskienė, Julė Jankauskienė, Jurga Miliauskienė,

Viktorija Vaštakaitė

Lithuanian Research Centre for Agriculture and Forestry, Institute of Horticulture, Lithuania

O-05-03

Effects of Light Intensity in Short Term Pre-harvest Lighting on the Post-harvest Quality of Lettuce

Qianxixi Min, Amanda M Lewis, Leo F. M. Marcelis, Ernst. J. Woltering

Wageningen University and Research, The Netherlands

O-05-04

Effects of a Seaweed Extract on the Productivity and Quality of Strawberry under Soilless Cultivation

Susana M. P. Carvalho¹, João F. Silva¹, Rita F. Pinheiro¹, Marta W. Vasconcelos²

¹*Faculdade de Ciências, Universidade do Porto, Departamento de Geociências Ambiente e Ordenamento do Território, Portugal*

²*CBQF - Centro de Biotecnologia e Química Fina – Laboratório Associado, Escola Superior de Biotecnologia, Universidade Católica Portuguesa/Porto, Portugal*

13:40–15:40 O-06. Crop Modeling

308

Chair: Tadahisa Higashide

Invited Speech

Crop Models: Variation between Plants and Bridging the Gap between Genotype and Phenotype

Ep Heuvelink¹, A. Maaik Wubs^{1,2}, Yutaka Tsutsumi^{1,2}, George Van Voorn², Lia Hemerik², Leo F. M. Marcelis¹, Fred A. Van Eeuwijk²

¹*Horticulture and Product Physiology group, Wageningen University and Research, The Netherlands*

²*Biometris, Wageningen University and Research, The Netherlands*

O-06-01

A Chlorophyll Fluorescence Parameter Based Model for Predicting Leaf Photosynthetic Rate of Cut Lilium Grown in Greenhouse

Shanxiang Yu, Gang Li, Dongsheng An, Ningyi Zhang, Weihong Luo

College of Agriculture, Nanjing Agricultural University, China

O-06-02

A Comparison of VegSyst and Mod-VegSyst Models in Predicting Dry Matter, Nitrogen Uptake and Transpiration of Greenhouse Grown Tomatoes

Irineo Lopez-Cruz¹, Agustín Ruiz-García², Antonio Martínez-Ruiz¹, Marisa Gallardo³

¹*Graduate Agricultural Engineering Program, University of Chapingo, Mexico*

²*Irrigation Department, University of Chapingo, Mexico*

³Department of Agronomy, University of Almería, Spanish

O-06-03

Estimation of a Whole Plant Photosynthesis of Irwin Mango Using 3-D Plant Model and Ray-tracing

Dae Ho Jung, Joon Woo Lee, Eek Son Jung

Department of Plant Science, Seoul National University, Korea

O-06-04

Classification of Water Status in Pakchoi (*Brassica Rapa L. ssp. Chinensis*) Based on Phenotyping and Machine Learning Modeling

Doudou Guo, Jiayang Juan, Liying Chang, Qiliang Niu, Danfeng Huang, Jingjin Zhang

School of agriculture and biology, Shanghai Jiao Tong University, China

August 21

16:40–18:00 O-07. Fertigation & Growing Medium Management (II) 306AB

Chair: Danfeng Huang

O-07-01

Development of an EC-based Closed Soilless Culture System for Minimization of Fertilizer Consumption and Control of Nutrient Balance

Tae In Ahn, Eek Son Jung

Department of Plant Science, Seoul National University, Korea

O-07-02

Beneficial Effects of Using Si for Organic Greenhouse Cucumber

Martine Dorais^{1,2}, Mireille Thériault²

¹Agassiz Research & Development Centre, Agriculture and Agri-Food Canada, CRIV, Laval University, Canada

²Agriculture and Agri-Food Canada, Centre de recherche et d'innovation sur les végétaux, Université Laval, Canada

O-07-03

Prospects and Challenges of Double Recirculating Aquaponic Systems (DRAPS) for Intensive Tomato Production

Johanna Suhl^{1,2}, Dennis Dannehl¹, Daniela Baganz², Werner Kloas^{3,4}, Benjamin Lehmann⁵, Sebastian Jobs⁵, Günther Scheibe⁵, Uwe Schmidt¹

¹Humboldt-Universität zu Berlin, Albrecht Daniel Thaer-Institute of Agricultural and Horticultural Sciences, Division of Biosystem Engineering, Germany

²Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Department of Biology and Ecology of Fishes, Germany

³Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Department of Ecophysiology and

Aquaculture, Germany

⁴*Humboldt-Universität zu Berlin, Department of Endocrinology, Institute of Biology, Germany*

⁵*PAL-Anlagenbau GmbH, Germany*

O-07-04

Characteristics of Acoustic Emissions from Tomato Plants under Water Stress Conditions

Ligen Yu^{1,2}, Liping Chen^{1,2}, Ruxue Wei^{1,2,3}, Wenzhong Guo^{1,2}, Xuzhang Xue^{1,2}, Youli Li^{1,2}

¹*National Engineering Research Center for Information Technology in Agriculture, China*

²*Key Laboratory of Agri-informatics, Ministry of Agriculture, China*

³*Beijing University of Agriculture, Plant Science and Technology College, China*

16:40–18:00 O-08. Product Quality (II)

307AB

Chair: Susana M.P. Carvalho

O-08-01

Rhizobacteria *Bacillus subtilis* Reduces Toxic Effects of High Electrical Conductivity in Soilless Culture of Lettuce

M. Seifi kalhor¹, S. Aliniaiefard², M. Seif², E. Javadi², O. Lastochkina³

¹*Department of biology, Shahid Beheshti University, Iran*

²*Department of Horticulture, College of Aburaihan, University of Tehran, Iran*

³*Bashkir Scientific Research Institute of Agriculture, Ufa, Russia*

O-08-02

Potential of Organo–mineral Substrate Waste from Hydroponic Systems Reused as Fertilizer in Open Field Lettuce Production

Dennis Dannehl, Uwe Schmidt

Humboldt-Universität zu Berlin, Germany

O-08-03

Influence of Irrigation Regimes and Fertigation Levels on Fruit Yield and Quality of Polyhouse Grown Bell Pepper

Shivappa Mantur¹, Mallikarjun Dhotre², Mallikarjun Biradar²

¹*PhD Scholar, Department of Horticulture, India*

²*Hi-Tech Horticulture Unit, University of Agricultural Sciences, India*

O-08-04

Greenhouse Vapour Pressure Deficit and Lighting Conditions during Growth Can Influence Postharvest Quality through the Function of Stomata

Sasan Aliniaiefard¹, Uulke Van Meeteren²

¹Department of Horticulture, College of Aburaihan, University of Tehran, Iran

²Horticulture and Product Physiology, Wageningen University, The Netherlands

16:40–18:00 O-09. Lighting Technology (II)

308

Chair: Eiji Goto

O-09-01

Irradiation with UV-B Fluorescent Bulbs Suppress Strawberry Powdery Mildew

Wataru Sugeno¹, Yasunaga Iwasaki², Yoshiaki Hachiya³

¹ Agricultural Production Corporation GRA Inc, Japan

² National Agriculture and Food Research Organization, Japan

³ Panasonic Lighting Devices Co., Ltd, Japan

O-09-02

Effect of Lighting Environment on Growth and Quality of Hydroponic Lettuce in Plant Factory

Dongxian He, Xin Zhang, Zhengnan Yan

Key Laboratory of Agricultural Engineering in Structure and Environment of Ministry of Agriculture, China Agricultural University, China

O-09-03

Transplant Lettuce Response to Different Percent Blue: Red PF Ratios in Indoor LED Sole Source Lighting Production

Hans Spalholz, Ricardo Hernández

Department of Horticultural Science, North Carolina State University, United States

O-09-04

Responses of Tomato Leaf Photosynthesis and Stomata Openness under Different Red and Blue LED Proportions and Intensity

Junwei Yang^{1,2}, Kai Cao^{1,2}, Lu Liu^{1,2}, Dawei Xu^{1,2}, Tingting Shen^{1,2}, Jie Yu^{1,2}, Hailiang Zhao^{1,2}, Kai Zhang^{1,2}, Zhirong Zou^{1,2}

¹ College of Horticulture, Northwest Agricultural & Forest University, China

² Key Laboratory of Protected Horticulture Engineering in Northwest, Ministry of Agriculture, China

Poster Presentations

15:40–16:40 Poster Session with Coffee Break

Topic: P-01. Lighting Technology

P-01-01

Effects of Monochromatic Red and White LEDs on Growth, Flowering and Photo-system II Performance of Calendula Officinalis

Mehdi Seif¹, Sasan Aliniaeifard¹, Tao Li², Mostafa Arab¹, Mehrjerdi Zare Mehrjerdi¹

¹*Department of Horticulture, College of Aburaihan, University of Tehran, Iran*

²*Institute of Environment and Sustainable, Development in Agriculture, Chinese Academy of Agricultural Science, China*

P-01-02

Effects of LED Supplementary Lighting to Improve Photosynthesis on the Growth and Yield of Strawberry Forcing Culture

Naoko Goto¹, Yukiko Honma¹, Manami Yusa¹, Wataru Sugeno¹, Yasunaga Iwasaki², Hiroshi Suzuki³, Tadashi Yoneda³, Shouko Hikosaka⁴, Yasuhiro Isogami⁴, Eiji Goto⁴

¹*Agricultural Production Corporation GRA Inc., Japan*

²*National Agriculture and Reserch Organization, Japan*

³*SHOWA DENKO K.K., Japan*

⁴*Graduate School of Horticulture, Chiba University, Japan*

P-01-03

Using Radiation to Enhance the Quality of Leafy Vegetables: A Mini-Review

Qingwu Meng, Erik Runkle

Department of Horticulture, Michigan State University, United States

P-01-04

Effects of Different Light Qualities on Growth and Pigment Contents of Plectranthus Scutellarioides

Lili Meng, Jiangfeng Song, Jun Liu, Liru Xia, Jianlong Liu, Lijun Yu, Yubang Tang

Jiangsu Academy of Agricultural Sciences, China

P-01-05

Effects of Light Quality During the Healing Stage on the Morphology and Growth of Grafted Tomato Seedlings Using Light Emitting Diodes and Cool White Fluorescents

Ricardo Hernandez¹, James Byrtus²

¹*Department of Horticultural Sciences, North Carolina State University, United States*

²LumiGrow, United States

P-01-06

Effect of Light/Dark Cycle on Photosynthetic Pathway Switching in Dendrobium PlantsYongsan Cheng, Dongxian He*Key Laboratory of Agricultural Engineering in Structure and Environment of Ministry of Agriculture, China Agricultural University, China*

P-01-07

The Pulsed LED Light Increases the Nutritional Quality of Basil MicrogreensViktorija Vaštakaitė¹, Akvilė Viršilė¹, Aušra Brazaitytė¹, Giedrė Samuolienė^{1,2}, Julė Jankauskienė¹, Pavelas Duchovskis^{1,2}¹*Institute of Horticulture, Lithuanian Research Centre for Agriculture and Forestry, Lithuania*²*Aleksandras Stulginskis University, Lithuania*

P-01-08

White LED Light with Wide Wavelength Spectrum Promotes High-Yielding and Energy-Saving Indoor Vegetable ProductionHatsumi Nozue², Kana Shirai², Koji Kajikawa³, Masao Gomi⁴, Masayuki Nozue¹¹*Faculty of Textile Science and Technology, Shinshu University, Japan*²*Research Center for Advanced Plant Factory, Shinshu University, Japan*³*Materials Engineering Dept., Nichia Corporation, Japan*⁴*Suwa Technology Center, Nichia Corporation, Japan*

P-01-09

Optimal LED Far-red Light Intensity in End-of-day Promoting Tomato Growth and Development in GreenhouseJie Yu, Kai Cao, Zhirong Zou*The Key Laboratory of Protected Horticultural Engineering in Northwest, Ministry of Agriculture, Department of Horticulture, Northwest A&F University, China*

P-01-10

Effects of Green Light Supplementation to Red Light and Blue Light on Growth and Amount of Photosynthetic Related Component in Leaf Lettuce PlantsIsaki Yuya¹, Ohashi-Kaneko Keiko²¹*Faculty of Agriculture, Tamagawa University, Japan*²*Research Institute, Tamagawa University, Japan*

P-01-11

Growth and Antioxidant Phenolic Content of Ice Plant Grown under Various Visible Light Spectrums in Plant Factories

Ji-Won Lee^{1,2}, Myung-Min Oh^{1,2}

¹*Division of Animal, Horticultural and Food Sciences, Chungbuk National University, Korea*

²*Brain Korea 21 Center for Bio-Resource Development, Chungbuk National University, Korea*

P-01-12

Effects of Blue/Red Light Ratio and Light Intensity on the Shape and Functional Compounds of Basil Leaves

Shoko Hikosaka, Fumihiko Moriyama, Eiji Goto

Graduate School of Horticulture, Chiba University, Japan

Topic: P-02. Crop Production & Management

P-02-01

Effects of Irrigation Amounts and Coverings on Growth and Yield of Broccoli

Chunyan Wu, Tingyu Song, Xiaoming Zhang, Shuyao Song

Jilin Agriculture University, China

P-02-02

Control Technologies Applied in Humidity Control in Mediterranean Greenhouses with Humidification System

Hui Wang^{1,2}, Jorge Antonio Sánchez Molina¹, Ming Li², Juan Carlos López¹

¹*The Automatic control, Robotics and Mechatronics research group, Department of informatics, University of Almeria, Spain*

²*Beijing Research Center for Information Technology in Agriculture/National Engineering Research Center for Information Technology in Agriculture/Key Laboratory for Information Technologies in Agriculture, Ministry of Agriculture/Beijing Engineering Research Center of Agricultural Internet of Things, China*

P-02-03

Effect of Different Films Mulching on Soil Environment and Tomato Plant Growth under Greenhouse Cultivation in Summer

Xueyan Zhang

Ningxia University, China

P-02-04

Effect of Reduced Nutrient Concentration and Foliar Fertiliser Application on Yield and Quality of Hydroponically Grown Mini-cucumber (*Cucumis Sativas L.*)

Martin Makgose Maboko, Christian Phillipus Du Plooy, Silence Chiloane

Agricultural Research Council - Vegetable and Ornamental Plants, South Africa

P-02-05

Effects of Different Supplemental Blue Light Intensity on Growth and Quality of Chinese Kale

Yamin Li, Yinjian Zheng, Houcheng Liu, Yiting Zhang, Shiwei Song
College of Horticulture, South China Agricultural University, China

P-02-06

Production of Organic Mother Plants under LED Artificial Light for the Production of Cuttings and Potted Herbs

Martine Dorais^{1,2,3}, Claudine Ménard², Blanche Dansereau³, Steeve Pepin⁴

¹*Agassiz Research & Development Centre, Agriculture and Agri-Food Canada, Canada*

²*Agriculture and Agri-Food Canada, Centre de recherche et d'innovation sur les végétaux Université Laval, Canada*

³*Dept. of Plant Science, Centre de recherche et d'innovation sur les végétaux, Université Laval, Canada*

⁴*Dept. of Soil Science and Agri-Food Engineering, Centre de recherche et d'innovation sur les végétaux, Université Laval, Canada*

P-02-07

Reconstruction Project for the Strawberry Production Greenhouse Area Damaged by the Great East Japan Earthquake

Yasunaga Iwasaki¹, Wataru Sugeno², Naoko Goto², Yukiko Honma², Manami Yusa², Mizuho Ito², Chisato Goto², Masuyuki Takaichi¹

¹*National Agriculture and Food Research Organization, Institute of Vegetable and Floriculture Science Japan*

²*GRA inc, Japan*

P-02-08

Control of a Soilborne Disease of Tomato by Grafting in a Greenhouse Condition in Indonesia

Triwiododo Arwiyanto, Bellarminus Trimman

Faculty of Agriculture, Gadjah Mada University, Indonesia

P-02-09

Integrated Nutrient Management for Protected Cultivation of Lettuce and Chinese Cabbage

Shivappa Mantur¹, Mallikarjun Biradar¹, Mallikarjun Dhotre²

¹*Hi-Tech Horticulture Unit, India*

²*Department of Horticulture, University of Agricultural Sciences, India*

P-02-10

Performance of Yard Long Bean under Different Protected Conditions with Varied Planting Geometry and Number of Seeds Per Hill

M. S. Biradar¹, S. M. Mantur¹, Mallikarjun Dhotre²

¹*Department of Horticulture, India*

²*Department of Horticulture, University of Agricultural Sciences, India*

P-02-11

Horizontal and Vertical Hydroponic Systems for Strawberry Production at High Densities

A. Ramírez-Arias, U. Hernández-Ibarra, J. Pineda-Pineda, E. Fitz-Rodríguez
University of Chapingo, Mexico

P-02-12

Greenhouse Hydroponic Lettuce Production Within Floating Raft Deep-Water Culture

Gene Giacomelli, Myles Lewis
University of Arizona, United States

P-02-13

Mechanisms of Salinity Tolerance of Cucumber (*Cucumis sativus* L.) Seedlings Grafted onto Cucurbita Rootstocks

Yan Li^{1, 2, 3}, Xuemei Tian¹, Qinghua Shi^{1, 2, 3, 4}, Fengjuan Yang^{1, 3, 4}, Biao Gong^{1, 2, 4}, Xiufeng Wang^{1, 3, 4}, Min Wei^{1, 2, 3}

¹*College of Horticultural Science and Engineering, Shangdong Agricultural University, China*

²*Scientific Observing and Experimental Station of Environment Controlled Agricultural Engineering in Huang-Huai-Hai Region, Ministry of Agriculture, China*

³*Shandong Collaborative Innovation Center of Fruit & Vegetable Quality and Efficient Production, China*

⁴*State Key Laboratory of Crop Biology, China*

P-02-14

Impact of Heating Location and Mechanical Ventilation on the Climate Distribution inside a Greenhouse Cucumber Crop

Pierre-Emmanuel Bournet¹, Eric Brajeul², Vincent Truffault², Clément Pinoit^{1, 2}

¹*Agrocampus Ouest, UP EPHor Environmental Physics and Horticulture Research Unit, France.*

²*CTIFL ZI Belle Etoile – Antarès 35, France*

P-02-15

Effect of CO₂ on the Ultrastructure of Cucumber Leaves under High Temperature Environment

Xian Du, Huanhuan Zhai, Shimao Cui, Yang Song, Lu Pan
Inner Mongolia Agricultural University, China

P-02-16

Yield of Two Varieties of Lettuce (*Lactuca sativa* L.) in Hydroponic and Aquaponic Systems

J. Pineda-Pineda, A. Valdez-Zamora, I. Miranda-Velázquez, J. E. Rodríguez-Pérez, J. Armando Ramírez-Arias, A. Lozano-Toledano

Universidad Autonoma Chapingo, Mexico

P-02-17

Culture of *Lilium* (*Lilium* sp.) "cv. Table dance" in an Aquaponic System

J. Pineda-Pineda, I. Miranda-Velázquez, A. Ramirez-Arias, R. Rivera-Del Rio, M. Vargas-Hernández, V. Roldán-Guzmán, A. García-Jaimes

Universidad Autonoma Chapingo, Mexico

P-02-18

The Calcium-Dependent Protein Kinase CDPK1 Regulates Development by Influencing the Hormone Homeostasis in Woodland Strawberry

Kai Zhang^{1,2}, Jiayue Feng^{1,2}, Zhirong Zou^{1,2}

¹*Northwest A&F University, China*

²*Key Laboratory of Protected Horticultural Engineering in Northwest, China*

P-02-19

Histological Characteristics of Decline Symptom and Growth Promotion by AMF in Asian Ginseng

Yuma Hiraki¹, Yoichi Matsubara²

¹*Graduate School of Applied Biological Sciences, Gifu University, Japan*

²*Faculty of Applied Biological Sciences, Gifu University, Japan*

P-02-20

Cross Protection to Salinity and Disease Caused by *Fusarium* spp. and Alleviation of Oxidative Stress in Mycorrhizal Vegetable Crops

Shiam Ibna Haque¹, Yoichi Matsubara^{1,2}

¹*The United Graduate School of Agricultural Science, Gifu University, Japan*

²*Faculty of Applied Biological Sciences, Gifu University, Japan*

Topic: P-03. Climate Control & Modeling

P-03-01

Numerical Investigation on Circulation Fan Effects in Naturally Ventilated a Multi-span Greenhouse

Sejun Park, In-Bok Lee, Rackwoo Kim, Sangyeon Lee, Jungyu Kim

Department of Rural Systems Engineering, College of Agriculture and Life Sciences, Seoul National University, Korea

P-03-02

Analysis of Air-temperature Profile on a Solar Heated Greenhouse with CFD

Efrén Fitz-Rodríguez¹, Irineo L. López-Cruz¹, Raquel Salazar-Moreno¹, Abraham Rojano-Aguilar¹, Pedro Romero-Gómez², Jose Eduardo Rosales-Vicelis¹, Jose Humberto López-Díaz¹

¹Universidad Autónoma Chapingo, Mexico

²Pacific Northwest National Laboratory, United States

P-03-03

An Solar Radiation Calculation Model of Sunlight Greenhouse and Software Development

Ming Li¹, Peng Lei¹, Dongmei Wen¹, Xu Wang², Mengmeng Liu¹, Xinting Yang¹

¹Beijing Research Center for Information Technology in Agriculture/National Engineering Research Center for Information Technology in Agriculture/National Engineering Laboratory for Agri-product Quality Traceability/Key Laboratory for Information Technologies in Agriculture, Ministry of Agriculture, China

²Shihezi University, China

P-03-04

CFD Analysis of Drag Force of Wind in a Typical Mexican Screenhouse

Jorge Flores-Velazquez¹, Waldo Ojeda¹, Jaime Rivera², Mauro Inigues¹, Abraham Rojano²

¹Researcher Irrigation Engineering Department, Instituto Mexicano de Tecnología del Agua (IMTA), Mexico

²University of Chapingo, Mexico

P-03-05

Minimization of Heterogeneous Air Condition Around Tomato Crops Using Perforating Duct and Fan System

Ryuta Ibuki

Miyagi University, Japan

P-03-06

Energy Balance Model in a Greenhouse Tomato Cultivation

Raquel Salazar Moreno, Ana Cristina Sánchez Martínez, Irineo López Cruz, Efrén Fitz Rodríguez, Abraham Rojano Aguilar

Autonomous University of Chapingo, Mexico

P-03-07

Analysis of a Fog Cooling System in Greenhouse Based on Computational Fluid Dynamics

Fang Zhang, Hui Fang, Ruifeng Chen, Qichang Yang

Institute of Environment and Sustainable Development in Agriculture, Chinese Academy of Agricultural Sciences, China

P-03-08

Insect-proof Screenhouses – a Comprehensive ViewMeir Teitel¹, Monica Garcia-Teruel Rguez¹, Hao Liang¹, Josef Tanny², Hana Alon³¹*Institute of Agricultural Engineering, Agricultural Research Organization, the Volcani Center, Israel*²*Institute of Soil, Water and Environmental Sciences, Agricultural Research Organization, the Volcani Center, Israel*³*MOP Darom, Besor Experimental Station, Israel*

P-03-09

A Review of Greenhouse Design Standard for Wind Load Action on GreenhouseRackWoo Kim, In-Bok Lee*Department of Rural Systems Engineering, College of Agriculture and Life Sciences, Seoul National University, Korea*

P-03-10

Cloud Awareness and Computing Service in Greenhouse Climate Monitoring and Production ManagementXin Zhang^{1,2}, Wengang Zheng¹, Xiaojun Qiao¹, Yunlong Bu³, Lipeng Guo⁴¹*Beijing Research Center for Information Technology in Agriculture, China*²*College of Water Conservancy and Civil Engineering, China Agricultural University, China*³*Beijing Kingpeng International Hi-Tech Corporation, Ltd, China*⁴*Shijiazhuang Academy of Agriculture and Forestry Sciences, China***Topic: P-04. Covering Materials**

P-04-01

Mapping Greenhouse Plastic Wastes in The West Region of PortugalM. Nanna¹, M. T. Batista², F. J. Baptista², E. Schettini¹, G. Vox¹¹*Department of Agricultural and Environmental Science, University of Bari, Italy*²*ICAAM - Instituto de Ciências Agrárias e Ambientais Mediterrânicas, Universidade de Évora, Portugal*

P-04-02

The Effects of Diffuse Light with Different Haze on the Net Photosynthetic Rate of Single TomatoXuguang Sun, Chenxi Li, Weitang Song*Key Laboratory of Agriculture Engineering in Structure and Environment, China Agricultural University, China*

P-04-03

Effects of Cultivation Ridge Direction on the Growth of Tomato under Diffuse Light

Xuguang Sun, Chenxi Li, Weitang Song, Pingzhi Wang, Shumei Zhao

Key Laboratory of Agriculture Engineering in Structure and Environment, China Agricultural University, China

P-04-04

Effects of Covering Films on Growth and Internal Environmental Factor of Korean Melon in Korea

Ji-Eun Lee^{1, 2}, Yong-Seub Shin¹, Han-Woo Do¹, Hyoung-Rac Sohn¹, Jong-Do Cheung¹, Su-Hwan Oh¹, Young-Hwa Kang²

¹*Seongju Korean Fruit Vegetable Research Institute Gyeongsangbuk-do Agricultural Research & Extension Services, Korea*

²*Department of Horticultural Science, Kyungpook National University, Korea*

P-04-05

Calculation of Overall Heat Transfer Coefficient of Greenhouse Coverings THROUGH Building Energy Simulation

Adnan Rasheed¹, Jong Won Lee², Wook Ho Na¹, Hyun Woo Lee¹

¹*Dep. of Agricultural Engineering, Kyungpook National University, Korea*

²*Institute of Agricultural Science & Technology, Kyungpook National University, Korea*

P-04-06

The Effect of Greenhouse Film on Temperature, Growth, and Yield of Tomato During Spring in Sichuan Basin

Zejin Zhang, Li Tang, Yuejian Li, Xiaojun Liu

Horticulture research institute, Sichuan Academy of Agricultural Sciences, China

Topic: P-05. Crop Modeling

P-05-01

Prediction of Daily Dry Matter Production of Greenhouse Tomato Plants without Destructive Measurement

Takeshi Saito, Yasushi Kawasaki, Yuya Mochizuki, Tetsuya Saito, Akio Ohyama, Tadahisa Higashide
Institute of Vegetable and Floriculture Science, National Agriculture and Food Research Organization, Japan

P-05-02

A New Method to Express Sink Strength of Greenhouse Tomato Fruit

Jiheng Ni

University of Jiangsu, China

P-05-03

Modeling Plant Gas Exchanges with a Mass and Energy Balance Coupling in Reduced

Gravity Environments

Lucie Poulet¹, Christel Paille², Claud-Gilles Dussap¹, Jean-Pierre Fontaine¹

¹*Université Clermont-Auvergne, France*

²*European Space Agency, France*

P-05-04

**Effects of Prolonged Water Restriction on Plant Interactions with Their Environment
Case of Potted Ornamental Crops Grown in Greenhouses**

Etienne Chantoiseau^{1,2}, Hacène Bouhoun Ali¹, Pierre Emmanuel Bournet¹, Patrice Cannavo¹

¹*EPHOr research unit, Agrocampus Ouest, France*

²*Rue André Le Nôtre, France*

P-05-05

Modelling Transpiration of Potted Rose Varieties

Oliver Koerner¹, Benita Hylgaard², Michael Hwang³, Eva Rosenquist³, Carl-Otto Ottosen²

¹*Danish Technological Institute, Denmark*

²*Aarhus University, Denmark*

³*University of Copenhagen, Denmark*

P-05-06

Simulating Lettuce Production in a Multi-Layer Moving Gutter System

Oliver Koerner¹, Jakob Skov Pedersen¹, Jens Jægerholm²

¹*Danish Technological Institute, Denmark*

²*Danish Greenhouse Supply, Denmark*

P-05-07

**Modeling the Responses of Environmental Conditions on Muskmelon Fruit Attributes
Using Machine Vision Measurement**

Liyang Chang, Sanpeng He, Jialin Xiang, Qian Liu, Danfeng Huang

School of Agriculture and Biology, Shanghai Jiao Tong University, China

Scientific Program

Aug.22(Tue)			
8:00	Registration (8:00-18:00)		
8:30	Keynote Speech II (8:30-9:10, 309AB) Speaker: Toyoki Kozai Chair: Gerard P.A. Bot		
9:00			
9:30	Coffee Break with Group Photo (9:10-9:50)		
10:00	Oral Session (9:50-12:00)		
10:30	O-10 Greenhouse System and Design (I) (307AB) Chair: Irineo Lopez-Cruz Invited: F.J. Baptista O-10-01: Frank Kempkes O-10-02: Yi Zhang O-10-03: Dianfan Zhou O-10-04: Vincent Truffault O-10-05: Liwei Yue O-10-06: Sajjad A. Rao	O-11 Plant Factory Technology (I) (308) Chair: Jung Eek Son Invited: Eiji Goto O-11-01: Wei Fang O-11-02: Jie He O-11-03: Cecilia Stanghellini O-11-04: Xiaoli Chen O-11-05: Ying Zhang O-11-06: M. P.C.M. Krijn	O-12 Crop Production & Management (II) (309AB) Chair: Carl-Otto Ottosen Invited: Jingquan Yu O-12-01: Xiuming Hao O-12-02: Yuqi Zhang O-12-03: Naomichi Fujiuchi O-12-04: Alejandro Bustamante O-12-05: Nhung Ngoc Hoang O-12-06: Wenjuan Yu
11:00			
11:30			
12:00			
12:30	Lunch (12:00-13:30, Function Halls A&B)		
13:00			
13:30	Oral Session (13:30-15:30)		
14:00	O-13 Covering Materials (306AB) Chair: Xiuming Hao Invited: Meir Teitel O-13-01: Silke Hemming O-13-02: Murat Kacira O-13-03: Ido Seginer O-13-04: Kexin Zheng	O-14 Lighting Technology (III) (307AB) Chair: Erik Runkle Invited: Chungui Lu O-14-01: Nieves García Victoria O-14-02: Carl-Otto Ottosen O-14-03: Yongran Ji O-14-04: Zhonghua Bian O-14-05: Ausra Brazaityte	Business Meeting for Sponsors (308) Chair: Zhirong Zou B-01 Megaphoton Inc B-02 Agri-Garden B-03 AEssense Technology B-04 Henan Yuhua B-05 Dalian YiJiaTianYuan B-06 USHIO SHANGHAI B-07 Richland Sources
14:30			
15:00			
15:30	Poster Session with Coffee Break (15:30-16:30) P-06/P-07/P-08		
16:00			
16:30	Oral Session (16:30-18:00)		
17:00	O-15 Climate Control & Modeling (II) (306AB) Chair: Meir Teitel O-15-01: Feije De Zwart O-15-02: Ukhyeon Yeo O-15-03: Evelia Schettini O-15-04: Weituo Sun O-15-05: Sang Min Lee	O-16 Lighting Technology (IV) (307AB) Chair: Matsuda Ryo O-16-01: Dália R.A. Carvalho O-16-02: Shalin Khosla O-16-03: Keiko Ohashi O-16-04: Rongqi Chen	ISHS Business Meeting (308) Chairs: Murat Kacira & Stefania De Pascale & Juan A. Fernández Commission Horticultural Engineering (CMEN) & Protected Cultivation (CMPC); WG meeting for Protected Cultivation in Mild Winter
17:30			
18:00			

Oral Presentations

8:30–9:10 Keynote Speech II

309AB

Chair: Gerard P.A. Bot

Smart Plant Factories and Greenhouses: Will Dreams Become Reality?

Toyoki Kozai

Japan Plant Factory Association, Japan

9:50–12:00 O–10. Greenhouse System and Design (I)

307AB

Chair: Irineo Lopez-Cruz

Invited Speech

Greenhouse Systems and Design: Innovative Solutions for Different Climates

F. J. Baptista¹, J. I. Montero², C. Stanghellini³, E. J. Baeza³, Q. Yang⁴, I. López-Cruz⁵

¹*Departamento de Engenharia Rural, Escola de Ciências e Tecnologia, Instituto de Ciências Agrárias e Ambientais Mediterrânicas, Universidade de Évora, Portugal*

²*Institut de Recerca i Tecnologia Agroalimentaries. Programa de Horticultura Ambiental, Spain*

³*Wageningen University and Research, Greenhouse Horticulture Unit, The Netherlands*

⁴*Institute of environment and sustainable development in Agriculture, Chinese Academy of Agricultural Science, China*

⁵*Graduate Agricultural Engineering Program, University of Chapingo, México*

O-10-01

Increase of Light Transmission in Winter by 10% in the Venlo-type Greenhouse: Design and Building of the Greenhouse

Frank Kempkes, Gert-jan Swinkels, Silke Hemming

Wageningen University and research, Greenhouse Horticulture, The Netherlands

O-10-02

Performance of Large-scale Greenhouse with Solar-assisted Heat Pump Heating System in Winter

Yi Zhang, Sheng Zhou, Hui Fang, Xinglin Ke, Qichang Yang

Institute of Environment and Sustainable in Agriculture, Chinese Academy of Agricultural Sciences, China

O-10-03

Environmental Impacts of Tomato Production in Greenhouses Versus Open Field

Dianfan Zhou^{1,2}, Mark Boersma¹, Holger Meinke¹, Leo F. M. Marcelis²

¹*School of Land and Food, University of Tasmania, Australia*

²*Horticulture and production Physiology Group, Wageningen University, The Netherlands*

O-10-04

Insights into the Potential of Semi-closed Greenhouses and Future Perspectives for Tomato Crops

Vincent Truffault, Benjamin Albert, Dominique Lesourd, Denis Loda, Serge Le Quillec, Eric Brajeul
Centre Technique Interprofessionnel des Fruits et Légumes, Centre de Carquefou, France

O-10-05

Performance Testing on Solar Capillary Heat Collection

Liwei Yue, Wenpeng Ji, Weitang Song

Key Laboratory of Agriculture Engineering in Structure and Environment, China Agricultural University, China

O-10-06

Impact of ‘Climate Energy Effect’ on Greenhouse Energy and Crop Production

Sajjad A. Rao

Assiniboine Community College, Canada

9:50–12:00 O–11. Plant Factory Technology (I)

308

Chair: Jung Eek Son

Invited Speech

Enhancement of Phytochemical Accumulation and Antioxidant Capacity of Plants by Addition of UV Light and/or Control of Nutrient Solution Temperature

Eiji Goto, Mizuki Ide, Kanako Hayashi, Eriko Ogawa, Yuki Saito, Shoko Hikosaka

Graduate School of Horticulture, Chiba University, Japan

O-11-01

Bioponics for Lettuce Production in Plant Factory

Wei Fang, Hsinying Chung

Dept. of Bio-Industrial Mechatronics Engineering, National Taiwan University, Chinese Taipei

O-11-02

LED-Integrated Vertical Aeroponic Farming System for Vegetable Production in Singapore

Jie He, Lin Qin, Tsui Wei Choong, Sing Kong Lee

National Institute of Education, Nanyang Technological University, Singapore

O-11-03

Resource Use Efficiency of Lettuce Production in Greenhouses and Plant Factories

Cecilia Stanghellini¹, Esteban Baeza¹, Luuk Graamans²

¹Wageningen University and Research, Greenhouse Horticulture Unit, The Netherlands

²Delft University of Technology, Faculty of Architecture and the Built environment, Delft, The Netherlands

O-11-04

Growth and Nutritional Properties of Lettuce Affected by Mixed Irradiation of White and Supplemental Light Provided by Light-emitting Diode

Xiaoli Chen

Beijing Research Center for Information Technology in Agriculture, China

O-11-05

Analysis of Environmental Uniformity in a Plant Factory Using CFD Analysis

Ying Zhang, Murat Kacira

Agricultural and Biosystems Engineering, University of Arizona, United States

O-11-06

Factors Critical to Plant Factory Performance

M. P. C. M. Krijn¹, R. F. M. Van Elmp², T. Van den Bergh², S. L. Van de Voort², C. C. S. Nicole¹

¹*Philips Research, The Netherlands*

²*Philips Lighting HorticultureLED Solutions, The Netherlands*

9:50–12:00 O–12. Crop Production & Management (II)

309AB

Chair: Carl–Otto Ottosen

Invited Speech

Integrating plant physiology and environmental cues for plant management in greenhouse crop production

Jingquan Yu

Department of Horticulture, Zhejiang University, China

O-12-01

Dynamic Temperature Control Strategy with a Temperature Drop Improved Responses of Greenhouse Tomatoes and Sweet Peppers to Long Photoperiods of Supplemental Lighting and Saved Energy

Xiuming Hao, Yun Zhang, Xiaobin Guo, Celeste Little, Jingming Zheng

Harrow Research and Development Centre, Agriculture and Agri-Food Canada, Canada

O-12-02

The Effect of Salt Stress on Photosynthetic Induction Process of Tomato

Yuqi Zhang, Qichang Yang, Tao Li

Institute of Environment and Sustainable Development in Agriculture, Chinese Academy of Agricultural Sciences, China

Key Laboratory of Energy Conservation and Waste Management of Agricultural Structures, Ministry of Agriculture, China

O-12-03

Commercially Attractive Ethylene-insensitive Tomato Cultivar for a Long-shelf Life, a High Yield and High Sweetness of Fruits

Naomichi Fujiuchi, Hideo Yoshida, Naoya Fukuda, Hiroshi Ezura

Faculty of Life and Environmental Sciences, University of Tsukuba, Japan

O-12-04

Interaction of Light Intensity and Relative Humidity on Formation and Responsiveness of Stomata in Tomato Plants

Alejandro J. Bustamante Davila^{1,2}, Wim Van Ieperen¹, Leo F. M. Marcelis¹

¹*Horticulture and Product Physiology Group, Wageningen University, The Netherlands*

²*Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias, Campo Experimental Rio Bravo, Mexico*

O-12-05

Advantages of Photoautotrophic Micropropagation for Wasabi Production

Nhung Ngoc Hoang¹, Yoshiaki Kitaya¹, Toshio Shibuya¹, Ryosuke Endo¹, Teruyuki Morishita²

¹*Department of Environmental Sciences and Technology, Osaka Prefecture University, Japan*

²*Business Development Group Solutioneering Dept., Yanmar Co., Ltd., Japan*

O-12-06

Comparison of Photosynthetic Activity in Real Time from Chlorophyll Fluorescence Sensor and Gas Exchange Sensor on Tomato Pannovy

Wenjuan Yu¹, Johanna Suhl^{1,2}, Dennis Dannehl¹, Thorsten Rockschi¹, Uwe Schmidt¹

¹*Division Biosystems Engineering, Humboldt University of Berlin, Germany*

²*Department of Biology and Ecology of Fishes, Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Germany*

13:30–15:30 O-13. Covering Materials

306AB

Chair: Xiuming Hao

Invited Speech

Greenhouse and Screenhouse Cover Materials: Literature Review and Industry Perspective

Meir Teitel¹, Helena Vitoshkin¹, Farhad Geoola¹, Stefan Karlsson², Noam Stahl³

¹*Institute of Agricultural Engineering, Agricultural Research Organization, the Volcani Center, Israel*

²*RISE Research Institutes of Sweden, Built Environment Division, Glass Section, Sweden*

³*Ginegar Plastic Products Ltd. Kibbutz Ginegar, Israel*

O-13-01

A Method to Quantify the Energy Saving Performance of Greenhouse Screen Materials

Silke Hemming, Esteban Jose Baeza Romero, Bram Van Breugel, Vida Mohammadkhani

Wageningen University and Research, The Netherlands

O-13-02

Crop Production and Energy Generation in a Greenhouse Integrated with Semi-transparent Organic Photovoltaics Covering

K. Okada¹, M. Matar², R. Shaheen², G. Farhad³, L. Asher³, O. Shay³, I. Yehia², M. Teitel³, M. Kacira¹

¹*Agricultural and Biosystems Engineering, University of Arizona, UNITED STATES*

²*Triangle Research and Development Center, Israel*

³*Agricultural Research Organization, Volcani Research Center, Israel*

O-13-03

A Mixing Length Model of Screenhouse Ventilation: Momentum and Energy Fluxes

Ido Seginer, Victor Lukyanov, Michael Neiman, Shabtai Cohen, Josef Tanny

Technion, Israel

O-13-04

Preliminary Application of Diffuse Light Film in Chinese Solar Greenhouse

Xexin Zheng, Qing Zhou, Yinghua Qu, Shumei Zhao, Pingzhi Wang, Shijing Sun, Binglin Fan

Key Laboratory of Agriculture Engineering in Structure and Environment, China Agricultural University, China

August 22

13:30–15:30 O-14. Lighting Technology (III)

307AB

Chair: Erik Runkle

Invited Speech

Uncovering LED Light Effects on Plant Growth: New Angles and Perspectives

Chungui Lu¹, Yate Ding² and Saffa Riffat²

¹*School of Animal, Rural and Environmental Sciences, Nottingham Trent University*

²*School of Biosciences, University of Nottingham*

O-14-01

LED Light (Top or Inter Lighting) Contribution to Energy Efficient Gerbera Cultivation

Nieves García Victoria¹, Frank Kempkes¹, Kees Weerheim¹, Frank Van der Helm²

¹*Wageningen UR Greenhouse Horticulture, The Netherlands*

²*InHolland Delft, The Netherlands*

O-14-02

LED or HPS in Ornamentals? Benefits and Challenges

Carl-Otto Ottosen¹, Katrine H. Kjær², Habtamu Giday², Theoharis Ouzounis²

¹*Aarhus University, Denmark*

²*Wageningen University, The Netherlands*

O-14-03

Far-red Induced Changes in Assimilate Partitioning in Tomato

Yongran Ji, Liying Gao, Jarno Mooren, Leo F.M. Marcelis, Ep Heuvelink

Wageningen University and Research, The Netherlands

O-14-04

Beneficial Effect of Green Light on PsbA and Lhcb Gene Expression and Alleviating Photo-inhibition in Lettuce (*Lactuca sativa* L.) under Short-term Continuous Light by Red and Blue-light Emitting Diodes

Zhonghua Bian^{1,2,3}, Qichang Yang^{1,2}, Tao Li^{1,2}, Ruifeng Cheng^{1,2}, Lingling Wei^{1,2}, Yuqi Zhang^{1,2}, Chungui Lu³

¹*Institute of Environment and Sustainable Development in Agriculture, Chinese Academy of Agricultural Sciences, China*

²*Key Laboratory for Energy Saving and Waste Disposal of Protected Agriculture, Ministry of Agriculture, China*

³*School of Animal, Rural and Environmental Sciences, Brackenhurst Campus, Nottingham Trent University, United Kingdom*

O-14-05

Changes of Mineral Element Contents in Microgreens Cultivated under Different Lighting Conditions in Greenhouse

Ausra Brazaityte¹, Akvile Virsile¹, Jule Jankauskiene¹, Giedre Samuoliene¹, Sandra Sakalauskiene¹, Algirdas Novickovas², Viktorija Vastakaite¹, Jurga Miliauskiene¹, Pavelas Duchovskis¹

¹*Lithuanian Research Centre for Agriculture and Forestry, Institute of Horticulture, Lithuania*

²*Institute of Applied Research, Vilnius University, Lithuania*

16:30–18:00 O-15. Climate Control & Modeling (II)

306AB

Chair: Meir Teitel

O-15-01

An App to Quantify the Effect of Screens on Energy Use and Crop Temperature

Profile in Greenhouses

Feije De Zwart, E. J. Baeza Romero, A. J. Van Breugel, V. Mohammadkhani, H. Jansen
Wageningen University and Research, Greenhouse Horticulture, The Netherlands

O-15-02

Determination of Priority of Structural Parameters for Large-scale Photobioreactor Design

Ukhyeon Yeo, In-Bok Lee

Department of Rural Systems Engineering, College of Agriculture and Life Sciences, Seoul National University, Korea

O-15-03

Green Facades to Enhance Climate Control Inside Buildings

Evelia Schettini¹, Carlo Alberto Campiotti², Giuliano Vox¹

¹Department of Agricultural and Environmental Science DISAAT, University of Bari, Italy

²ENEA - Italian National Agency for New Technologies, Energy and Sustainable Economic Development, Italy

O-15-04

A Heating and Cooling System in Chinese Solar Greenhouse (CSG) Based on the Energy of Surplus Air and Surface Water for Year-round Production

Weituo Sun, Wenzhong Guo

Beijing Research Center of Intelligent Equipment for Agriculture, Beijing Academy of Agriculture and Forestry Sciences, China

O-15-05

Development of Energy Efficient Horticultural System based on Gas Engine Driven Heat Pumps

Sang Min Lee¹, Young Duk Lee¹, Sang Yeob Kim¹, Chang Up Kim¹, Kyong Sub Park²

¹Korea Institute of Machinery & Materials, Korea

²National Institute of Horticultural and Herbal Science, Korea

16:30–18:00 O-16. Lighting Technology (IV)

307AB

Chair: Matsuda Ryo

O-16-01

Effect of Light Quality and Intensity on Leaf Developmental Rate and Timing of First Truss Formation in Tomato

Dália R. A. Carvalho, Wim Van Ieperen

Horticulture and Product Physiology, Plant Sciences Group, Wageningen University and Research,

The Netherlands

O-16-02

Effects of Far-red LEDs on Plant Growth, Fruit Yield and Quality of Greenhouse Fruit Vegetables Grown under High Pressure Sodium Lighting

Xiuming Hao¹, Rong Cao², Shalin Khosla³, Celeste Little¹, Jingming Zheng¹

¹*Harrow Research and Development, Agriculture and Agri-Food Canada, Canada*

²*Guelph Research and Development Centre, Agriculture and Agri-Food Canada, Canada*

³*Ontario Ministry of Agriculture Food and Rural Affairs, Canada*

O-16-03

Determination of Optimum Red, Blue and Green Lighting Conditions for Production of Leaf Lettuce Plants Cultured under LEDs

Keiko Ohashi, Yuya Isaki, Hiroyuki Watanabe

Tamagawa University, Japan

O-16-04

Effects of Light Quality on Carbohydrate Metabolism, Yield and Quality of Tomato Fruits

Guofeng Xin¹, Rongqi Chen¹, Na Sun¹, Min Wei^{1, 2}, Yan Li¹, Xiufeng Wang^{1, 3}, Fengjuan Yang^{1, 3}, Qinghua Shi^{1, 2}

¹*College of Horticultural Science and Engineering, Shandong Agricultural University, China*

²*Scientific Observing and Experimental Station of Environment Controlled Agricultural Engineering in Huang-Huai-Hai Region Ministry of Agriculture, China*

³*State Key Laboratory of Crop Biology, China*

Poster Presentations

15:30–16:30 Poster Session with Coffee Break

Topic: P-06. Crop production & management

P-06-01

Effect of Secondary Metabolites of *Lamiaceae* Herbs on Anthracnose Control in Strawberry

Yuma Hiraki¹, Yoichi Matsubara²

¹*Graduate School of Applied Biological Sciences, Gifu University, Japan*

²*Faculty of Applied Biological Sciences, Gifu University, Japan*

P-06-02

The Optimization of Crop seeds Packaging Production Planning Based on Dynamic Lot-sizing Model

Yihang Zhu¹, Jingjin Zhang¹, Danfeng Huang¹, Na Geng²

¹*School of Agriculture & Biology, Shanghai Jiao Tong University, China*

²*Dept. of Industrial Engineering & Management, Shanghai Jiao Tong University, China*

P-06-03

Estimation of Water Stress by Rapid Proline Analysis in Paprika (*Capsicum Annuum* L.)

Min Ji Lee¹, Gyeong Lee Choi², Sang Seok Oh³, Jae Taek Lee⁴, Jung Su Jo¹, Shiva Ram Bhandari¹, Jun Gu Lee^{1,5}

¹*Department of Horticulture, College of Agriculture & Life Sciences, Chonbuk National University, Korea*

²*Protected Horticulture Research Station, National Institute of Horticulture & Herbal Science, Rural Development Administration, Korea*

³*Gyeongnam Agricultural Research & Extension Services, Korea*

⁴*Fruit Vegetable Research Institute, Korea*

⁵*Institute of Agricultural Science & Technology, Chonbuk National University, Korea*

P-06-04

Iron Homeostasis and Cutting Root to Enhance Iron Content in Spinach and Kale

So-Ra Lee^{1,2}, Sin-Ae Park³, Myung-Min Oh^{1,2}

¹*Division of Animal, Horticultural and Food Sciences, Chungbuk National University, Korea*

²*Brain Korea 21 Center for Bio-Resource Development, Chungbuk National University, Korea*

³*Department of Environmental Health Science, Konkuk University, Korea*

P-06-05

Nutrient Solution Formulations for Paprika Cultivation in the Closed Hydroponic System with a Coir Substrate in Winter Cropping Season

Kyung-Hwan Yeo, Gyeong Lee Choi, Jung-Sup Lee, Jae Han Lee, Kyoung Sub Park, Bekhzod Khoshimkhujaev, Jin Hyun Kim

Protected Horticulture Research Institute, National Institute of Horticultural and Herbal Science, Rural Development Administration, Korea

P-06-06

Sucrose Absorption via Roots Improves Bioactive Compounds of Mugwort and Kale

Moon-Sun Yeom^{1,2}, Myung-Min Oh^{1,2}, Jung-Soo Lee^{1,2}, Hye-Jin Jeong^{1,2}

¹*Division of Animal, Horticultural and Food Sciences, Chungbuk National University, Korea*

²*Brain Korea Center for Bio-Resource Development, Chungbuk National University, Korea*

P-06-07

The Effect of Plastic Mulch on Soil Temperature, Growth, and Yield of Cucumber During Fall in a Poor Light Region

Zejin Zhang, Li Tang, Yuejian Li, Xiaojun Liu

Horticulture research institute, Sichuan Academy of Agricultural Sciences, China

P-06-08

Flowering and Photosynthetic Responses of *Doritaenopsis* Queen Beer 'Mantefon' to CO₂ Enrichment at Different EC Concentrations

Ah Ram Cho, Su Jung Song, Yoon Jin Kim

Department of Horticulture, Biotechnology and Landscape Architecture, Seoul Women's University, Korea

P-06-09

Night Interruption with Red Light and CO₂ Supply to Enhance Stevia Yield and Steviolosides Content

Nieves García Victoria¹, Sascha Weber²

¹*Wageningen University and Research, Glastuinbouw, The Netherlands*

²*Wageningen University and Research, The Netherlands*

P-06-10

Energy Saving Innovations Contribute to a More Sustainable Production of *Alstroemeria*

Nieves García Victoria¹, Feije De Zwart¹, Johan Steenhuizen¹, Peter Van Weel², Marco De Groot³

¹*Wageningen University and Research, Glastuinbouw, The Netherlands*

²*Weel.Invent, The Netherlands*

³*Flori Consult Group, The Netherlands*

P-06-11

A New Agro-industry Compost as Growing Medium for Growing Baby-leaf Lettuces in Floating Systems

Juan A Fernández¹, Almudena Giménez¹, Catalina Egea-Gilabert², Margarita Ros³, José A Pascual³

¹*Departament of Plant Production, Technical University of Cartagena, Spain*

²*Departament of Agricultural Science and Technology, Technical University of Cartagena, Spain*

³*Departament of Soil Water Conservation and Organic Waste Management, Centro de Edafología y Biología Aplicada del Segura (CEBAS-CESIC), Spain*

P-06-12

Commercial Application of a Photoautotrophic Micropropagation System

Yulan Xiao, Shihao Jiang

Yangtze Delta Region Institute of Tsinghua University, China

P-06-13

Effects of Supplemental Blue Light Intensity on Growth and Quality of Pak-choi

Yinjian Zheng, Houcheng Liu, Yamin Li, Yiting Zhang, Shiwei Song

College of Horticulture, South China Agricultural University, China

P-06-14

Development of Three-dimensional Shape Measurement Technology of Strawberries

M. Takahashi¹, H. Umeda², Y. Iwasaki², O. Koike¹, S. Takayama¹, H. Kano¹, Y. Honma³, N. Goto³, W. Sugeno³, M. Yusa³

¹*Miyagi Prefectural Institute of Agriculture and Horticulture, Japan*

²*National Agriculture and Food Research Organization, Japan*

³*Agricultural Production Corporation GRA Inc., Japan*

P-06-15

Application of Balanced Sowing Model for Four Fast-growing Leafy Vegetables Production in Tropical Climate

Rixin Xiao¹, Daolong Liao¹, Baibi Zhu¹, Haiyun Wu¹, Zhenzhen Pang², Yang He²

¹*Institute of Vegetables, Hainan Academy of Agricultural Sciences, China*

²*Hainan University, China*

P-06-16

An Analysis of Greenhouse Heat Preservation Quilt Management in Winter

Qingyu Xue, Zhenfa Li, Shumei Liu, Chun Li, Chaoyang Dong, Zhihong Gong

Tianjin Climate Center, China

P-06-17

Selection of Optimum Plug Cell Size for *Astragalus Membranaceus* Plug Seedling

Hye Min Kim¹, Hyun Min Kim¹, Seung Jae Hwang^{1, 2, 3}

¹*Department of Horticulture, Division of Applied Life Science, Graduate School of Gyeongsang National University, Korea*

²*Department of Horticulture, College of Agriculture & Life Sciences, Gyeongsang National University, Korea*

³*Institute of Agriculture & Life Sciences, Gyeongsang National University, Korea*

P-06-18

Developing Techniques for Counting Strawberry Flowers in Movable Bench Systems in a Greenhouse

Hiroki Naito, Keita Yoshinaga, Tokihiro Fukatsu, Shigehiko Hayashi, Shogo Tsubota, Satoshi Yamamoto

Institute of Agricultural Machinery NARO, Japan

P-06-19

This Phytoextraction of Metals by Native Plants from Mining Wastes in Zacatecas, Mexico

A. R. Ibarra-García¹, I. D. Barceló-Quintal¹, J. García-Albortante¹, A. L. López-Lafuente², C-González-Huecas², J. R. Quintana-Nieto², V. Mugica-Alvarez¹

¹*Universidad Autónoma Metropolitana-Azcapotzalco, Mexico*

²*Universidad Complutense de Madrid, Spain*

P-06-20

Effects of Different Growing Substrates on Strawberry Production

Most Tahera Naznin, Xiuming Hao, Shalin Khosla, Celeste Little, JingMing Zheng

Harrow Research and Development Centre, Agriculture and Agri-Food Canada, Canada

Topic: P-07. Plant Factory Technology

P-07-01

Leaf Area Index in Urban Agriculture

Abraham Aguilar Rojano¹, Raquel Salazar Moreno¹, Efren Fitz Rodríguez¹, Irineo Lopez Cruz¹, Uwe Schmidt², Dennis Dannehl²

¹*University of Chapingo, Mexico*

²*University of Humboldt, Germany*

P-07-02

Effects of Red Light Intensity During Irradiation with a Mixture of Ultraviolet A Light and Red Light on Vinblastine Production in Leaves of Catharanthus Roseus

Taro Fukuyama¹, Keiko Ohashi-Kaneko¹, Takatoki Ookusu¹, Kazumasa Hirata², Misa Muraoka²,

Hiroyuki Watanabe¹

¹Tamagawa University, Japan

²Osaka University, Japan

P-07-03

Assessment of Tomato Leaf Water Content by Using Portable Hyperspectral Camera in Plant Factory

Tiejun Zhao, Hiroki Umeda, Akimasa Nakano, Yasunaga Iwasaki

Institute of Vegetable and Floriculture Science, NARO, Japan

P-07-04

Supplemental Lighting Applied to Inner or underneath Canopy Enhanced Leaf Photosynthesis, Stomatal Regulation and Plant Development of Tomato under Limiting Light Condition

Chengyao Jiang¹, Masahumi Johkan¹, Toru Maruo¹, Masaaki Hohjo¹, Satoru Tsukagoshi¹, Mitsuru Ebihara², Akio Nakaminami²

¹Graduate School of Horticulture, Chiba University, Japan

²Mitsubishi Plastic Agri Dream Co., LTD, Japan

P-07-05

The Research of Automatic Transmission Stereo Cultivation Bed System

Jing Zhao^{1,2}, Zengchan Zhou^{1,2}, Yunlong Bu^{1,2}, Lei Liang^{1,2}, Si Li^{1,2}, Tao Yao^{1,2}

¹Beijing Kingpeng International Hi-Tech Corporation, China

²Beijing Engineering Research Center of Plant factory, China

P-07-06

Growing Low Potassium and Low Sodium Lettuce in Plant Factory

Hsinying Chung, Wei Fang

Dept. of Bio-Industrial Mechatronics Engineering, National Taiwan University, Chinese Taipei

P-07-07

Dynamic Use of Spectra During Plant Development

Carl-Otto Ottosen, Benita Hyldgaard

Aarhus University, Denmark

P-07-08

Effects of Different CO₂ Concentrations on the Carbon Fixation and Production and Quality of Lettuce under Artificial Light Source

Danyan Chen, Zheng Kong

College of horticulture in Northwest Agriculture and Forestry University, China

P-07-09

Development of Leafy Vegetables Containing Low Level of Potassium Production Technology Using Hydroponics in Plant Factory

Young Bae Choi, Yong Wan Kim, Seung Min Song, Jong Hwa Shin

Department of Horticulture and Breeding, Andong National University, Korea

P-07-10

Growth and Nutrient Level in Water Spinach (*Ipomoea aquatica* Forsk.) in Response to LED Light Quality in Plant Factory

Jarinee Khwankaew^{1,2}, Duyen T.P. Nguyen¹, Natsuko Kagawa¹, Michiko Takagaki¹, Gauri Maharjan³, Na Lu¹

¹ *Center for Environment, Health and Field Sciences, Chiba University, Japan*

² *Department of Plant Science, Faculty of Science, Mahidol University, Japan*

³ *Horticulture LED Solutions, Philips Lighting, Japan*

P-07-11

Environmental Control for Recombinant Protein Production in Plants using Transient Gene Expression Technology

Ryo Matsuda¹, Naomichi Fujiuchi², Kazuhiro Fujiwara¹

¹ *The University of Tokyo, Japan*

² *University of Tsukuba, Japan*

P-07-12

Research of Plant Factory Carbon Reduction Technology

Rong Zhang, Tong Liu, Jianshe Ma

Graduate School at Shenzhen, Tsinghua University, China

P-07-13

Effect of Different Light Environments on Runner Formation and Flower Bud Formation in Everbearing Strawberry

Atsushi Ichimura, Hiroyuki Watanebe

Tamagawa University, Japan

P-07-14

Supplemental Far-red Light and Air Anion Enhance the Growth and Phenolic Compounds of *Crepidiastrum Denticulatum*

Song-Yi Park^{1,2}, Ji-Hoon Bae³, Sang-Min Kim⁴, Myung-Min Oh^{1,2}

¹ *Division of Animal, Horticultural and Food Sciences, Chungbuk National University, Korea*

² *Brain Korea 21 Center for Bio-Resource Development, Chungbuk National University, Korea*

³ *Next A Co.,Ltd., Korea*

⁴ *Natural Products Research Center, KIST Gangneung Institute of Natural Products, Korea*

P-07-15

Improvement of the Uniformity of Air Flow and Temperature in a Plant Factory by CFD Modelling and Experimental Validation

Ruifeng Cheng

Institute of Environment and Sustainable Development in Agriculture, Chinese Academy of Agricultural Sciences, China

Topic: P-08. Fertigation & Growing Medium Management

P-08-01

Rooting Behavior at Dry–Wet Soil Boundary under Extremely Water Saved Condition

Qichen Li¹, Sakae Shibusawa², Toshiaki Sugihara², Masakazu Kodaira²

¹*United Graduated school of Agriculture Science, Tokyo University of Agriculture and Technology, Japan*

²*Institute of Agriculture, Tokyo University of Agriculture and Technology, Japan*

P-08-02

Water for Urban Agriculture in Mexico City

Abraham Rojano¹, Luis Carlos Miranda², Irineo Lopez¹, Raquel Salazar¹, Efren Fitz¹, Uwe Schmidt²

¹*University of Chapingo, Chapingo, Mexico*

²*University of Humboldt, Germany*

P-08-03

Effects of Mixed Corn Stalk Substrates on Growth and Photosynthesis of Tomato Seedlings

Shanshan Chen¹, Shuyao Song¹, Chunyan Wu¹, Chunbo Zhao¹, Chuanwei Zhang², Tao Wen³

¹*Department of Horticultural, Jilin Agricultural University, China*

²*Agricultural Bureau of Anqiu City, China*

³*The Agricultural High&New Technology Development Zone, China*

P-08-04

Rhizobacteria *Bacillus Subtilis* Reduces Toxic Effects of High Electrical Conductivity in Soilless Culture of Lettuce

Maryam Seifi Kalhor¹, Sasan Aliniaieifard², Mehdi Seif², Elahe Javadi², Tao Li³, Oksana Lastochkina⁴

¹*Department of biology, Shahid Beheshti University, Iran*

²*Department of Horticulture, College of Aburaihan, University of Tehran, Iran*

³*Institute of Environment and Sustainable, Development in Agriculture, Chinese Academy of Agricultural Science, China*

⁴*Bashkir Scientific Research Institute of Agriculture, Russia*

P-08-05

Enhancement of Growth and Photosynthetic Performance of Soilless-cultured Corn Exposed to Cadmium Toxicity Using Gamma Aminobutyric Acid (GABA)

Maryam Seifi Kalhor¹, Francoise Bernard¹, Sasan Aliniaieifard², Mehdi Seif², Tao Li³

¹*Department of biology, Shahid Beheshti University, Iran*

²*Department of Horticulture, College of Aburaihan, University of Tehran, Iran*

³*Institute of Environment and Sustainable, Development in Agriculture, Chinese Academy of Agricultural Science, China*

P-08-06

Assessing the Salinity Effects on Yield, Leaf Gas Exchange and Nutritional Quality of Spring Greenhouse Lettuce

Ida Di Mola, Youssef Rouphael, Lucia Ottaiano, Luigi Giuseppe Duri, Mauro Mori, Stefania De Pascale

Department of Agricultural Sciences, University of Naples Federico, Italy

P-08-07

Influence of Fertigation on Growth and Yield of Broccoli and Red Cabbage under Shadehouse

M. S. Biradar¹, S. M. Mantur¹, Mallikarjun Dhotre²

¹*Hi-Tech Horticulture Unit, India*

²*Department of Horticulture, University of Agricultural Sciences, India*

P-08-08

Using Linear Programming for Optimizing Nutrient Solution Final Price

M. Delshad, F. Ashjaei, H. Lesani

Department of Horticultural Science, University College of Agriculture and Natural Resources, University of Tehran, Iran

P-08-09

The Mitigation Effects of Melatonin on Chilling-induced Stress in Cucumber toward Up-regulating CsZat12 and Moderating the Metabolism of PAs and ABA

Hailiang Zhao¹, Yuping Wang², Linjie Xi¹, Hongjun Xu^{4,1}, Kun Li^{3,1}, Junwei Yang¹, Jie Yu¹, Tonghua Pan¹, Lu Liu¹, Tingting Shen¹, Zhirong Zou¹

¹*Northwest A&F University, China*

²*Gansu Agriculture Technology College, China*

³*Chinese Academy Of Agricultural Sciences, China*

⁴*Xinjiang Angriculture University, China*

P-08-10

Investigation and Comparison of Water Movement Properties among Several Media for Precise Irrigation Control at Soilless Culture of Fruit Vegetable

Young Bae Choi, Jong Hwa Shin

Department of Horticulture and Breeding, Andong National University, Korea

P-08-11

Effect of Potassium Supply in Nutrient Solution on Photosynthetic Electron Transport of Tomato Leaves

Jinxu Song, Dongxian He

Key Laboratory of Agriculture Engineering in Structure and Environment, China Agricultural University, China

P-08-12

Optimization of Nutrient Supply in Closed Irrigation Systems using Ion-selective Electrodes

Thorsten Rocks¹, Angela Schmidt, Hans-Peter Kläring

Leibniz Institute of Vegetable and Ornamental Crops, Germany

P-08-13

Use of Ion-selective Sensors in Closed Irrigation Systems

Thorsten Rocks^{1,2}, Hans-Peter Kläring¹, Uwe Schmidt²

¹*Leibniz Institute of Vegetable and Ornamental Crops, Germany*

²*Humboldt-Universität zu Berlin, Germany*

P-08-14

Partial substitution of mineral fertilizer with bio-fertilizer enhances cauliflower quality

Jie Li¹, Ping Yang¹, Jianming Xie², Jihua Yu², Jian Lyu²

¹*College of Life Science and Technology, Honghe University, China*

²*College of Horticulture, Gansu Agricultural University, China*

Scientific Program

Aug.23(Wed)		
8:00	Registration (8:00-18:00)	
8:30	Keynote Speech III (8:30-9:10, 309AB) Speaker: Juan I. Montero Chair: Silk Hemming	
9:00	Poster Session with Coffee Break (9:10-10:00) P-09/P-10/P-11	
9:30		
10:00	<div> <div> O-17 Greenhouse System and Design (II) (307AB) Chair: In-Bok Lee Invited: Qichang Yang O-17-01: E. J. Baeza Romero O-17-02: Meir Teitel O-17-03: Jianming Li O-17-04: Fatima Baptista O-17-05: Sangyeon Lee </div> <div> Oral Session (10:00-12:00) O-18 Plant Factory Technology (II) (308) Chair: Wei Fang Invited: Murat Kacira O-18-01: Tomohiro Jishi O-18-02: Eri Hayashi O-18-03: Zengchan Zhou O-18-04: Suthisak Saengtharapit O-18-05: Yuxin Tong </div> <div> O-19 Climate Control & Modeling (III) (309AB) Chair: Pierre-Emmanuel Bournet O-19-01: Hicham Fatnassi O-19-02: T. M. Ramírez Jiménez O-19-03: Philip A. Davies O-19-04: Bo Zhou O-19-05: Kazuhiro Fujiwara O-19-06: Takeshi Kuroyanagi </div> </div>	
10:30		
11:00		
11:30		
12:00		
12:30	Lunch (12:00-13:30, Function Halls A&B)	
13:00		
13:30	<div> <div> O-20 Crop Production & Management (III) (306AB) Chair: Chungui Lu O-20-01: Dimitrios Savvas O-20-02: Xiaoting Zhou O-20-03: Fengzhi Wu O-20-04: Mizuho Itoh O-20-05: Abraham R. Aguilar </div> <div> Oral Session (13:30-15:00) O-21 Plant Factory Technology (III) (307AB) Chair: Kazuhiro Fujiwara O-21-01: Yuming Fu O-21-02: Yuanhao Chen O-21-03: Hiroki Umeda O-21-04: Pei-Chen Huang </div> <div> CFD Working Group Meeting (308) Chair: Hicham Fatnassi </div> </div>	
14:00		
14:30		
15:00	Closing Ceremoney (15:00-15:30, 309AB)	
15:30		
16:00		
16:30		
17:00		
17:30		
18:00		

Oral Presentations

8:30–9:10 Keynote Speech III

309AB

Chair: Silk Hemming

Innovative Systems for Sustainable Greenhouse Production

Juan I. Montero¹, Antón Assumpció¹, Lorenzo Pilar²

¹*Irta, Cabrls Barcelona, Spain*

²*Ifapa, Centro La Mojonera, Almería, Spain*

10:00–12:00 O-17. Greenhouse System and Design (II)

307AB

Chair: In-Bok Lee

Invited Speech

Solar Thermal Utilization and Structure Innovation of Chinese Solar Greenhouse

Qichang Yang, Yi Zhang, Hui Fang, Wei Lu, Bo Zhou, Xinglin Ke

Institute of Environment and Sustainable Development in Agriculture, Chinese Academy of Agricultural Sciences, China

O-17-01

Characterization of Air Velocities Near Greenhouse Internal Mobile Screens Using 3D Sonic Anemometry

E. J. Baeza Romero, S. Hemming, A. J. Van Breugel, V. Mohammadkhani, H. Jansen, F. Kempkes

Wageningen University and Research, Greenhouse Horticulture, The Netherlands

O-17-02

Effect of Wind Speed and Direction on Forces Acting on Shade Nets Covering Orchard Trees

Pablo Ibanez¹, Meir Teitel¹, Josef Tanny²

¹*Institute of Agricultural Engineering, Agricultural Research Organization, the Volcani Center, Israel*

²*Institute of Soil, Water and Environmental Sciences, Agricultural Research Organization, the Volcani Center, Israel*

O-17-03

Design and Analysis of Temperature and Humidity Performance in Large-scale Asymmetric Tunnel with Water Control Brewed Hot System

Xiaohui Hu¹, Haizhong Wei², Jinxin Xiao¹, Yu Guo¹, Jianming Li¹

¹*College of Horticulture, Northwest A&Forest University, China*

²*Taizhou Vocational College of Science and Technology, China*

O-17-04

Energy Consumption and GHG Emission of Zucchini (*Cucurbita Pepo* L.) Cultivated in Hydroponic Greenhouses in the West Region of Portugal

Fátima Baptista, Luis Silva, Dina Murcho

ICAAM - Instituto de Ciências Agrárias e Ambientais Mediterrânicas, Universidade de Évora, Núcleo da Mitra, Portugal

O-17-05

Design of Greenhouse Energy Model Including Plant Energy Exchange and Estimation of Energy Loads by Building Energy Simulation

Sangyeon Lee, In-Bok Lee, Rackwoo Kim, Ukhyeon Yeo, Gwanyong Park

Department of Rural Systems Engineering, College of Agriculture and Life Sciences, Seoul National University, Korea

10:00–12:00 O–18. Plant Factory Technology (II)

308

Chair: Wei Fang

Invited Speech

Climate Control and Environmental Uniformity in Plant Factories with Artificial Lighting

Murat Kacira

Agricultural and Biosystems Engineering, The University of Arizona, UNITED STATES

O-18-01

Temporally Shifted Irradiation of Blue and Red LED Light Promotes Cucumber and Cos Lettuce Growth

Tomohiro Jishi, Ryo Matsuda, Kazuhiro Fujiwara

The University of Tokyo, Japan

O-18-02

Global Plant Factory Industry and Market Creation for the Future

Eri Hayashi

Japan Plant Factory Association, Japan

O-18-03

Research and Experiment of Efficient Cultivation of Mobile Plant Factory

Dongxing Li^{1,2}, Zengchan Zhou^{1,2}, Yunlong Bu^{1,2}, Jing Zhao^{1,2}, Si Li^{1,2}, Jianhong Wu^{1,2}

¹*Beijing Kingpeng International Hi-Tech Corporation, China*

²*Beijing Engineering Research Center of Plant factory, China*

O-18-04

Cost performance of romaine lettuce (*Lactuca sativa*) growth by different light spectra and intensities of supplemental upward LED lighting in plant factory

Suthisak Saengtharapip^{1,2}, Na Lu², Michiko Takagaki^{1,2}

¹Graduate School of Horticulture, Chiba University, Japan

²Center for Environment, Health and Field Sciences, Chiba University, Japan

O-18-05

Plant growth and electric-energy saving for lighting as affected by light environment in the cultivation space of plant factory with LEDs

Yuxin Tong^{1,2}, Qichang Yang^{1,2}, Kozai Toyoki³

¹Institute of Environment and Sustainable in Agriculture, Chinese Academy of Agricultural Sciences, China

²Key Laboratory for Energy Saving and Waste Disposal of Protected Agriculture, Ministry of Agriculture, China

³Center for Environment, Health and Field Sciences, Chiba University, Japan

10:00–12:00 O-19. Climate Control & Modeling (III)

309AB

Chair: Pierre-Emmanuel Bournet

O-19-01

Using CFD Modeling as Decision Support Tool for Early Warning against Pests of Greenhouse Crops

Hicham Fatnassi, Ricardo Suay, Cecile Bresch, Bruno Paris, Christine Poncet

INRA, Univ. Nice Sophia Antipolis, CNRS, UMR 1355-7254. Institut Sophia Agrobiotech, 06900 Sophia Antipolis, France

O-19-02

Response of Interrupting the Dark Phase on Photosynthesis, Growth and Yield of Tomato

Tundra Margarita Ramírez Jiménez, Hans-Peter Kläring

Leibniz Institute of Vegetable and Ornamental Crops, Germany

O-19-03

Seawater Greenhouse Technology for Sustainable Intensification of Agriculture in World's Arid Regions

Philip A. Davies¹, Takeshi Akinaga¹, Opubo Igobo¹, Sotos Generalis¹, Charlie Paton², Chris Rothera²

¹Sustainable Environment Research Group, School of Engineering and Applied Science, Aston University, United Kingdom

²Seawater Greenhouse Ltd, United kingdom

O-19-04

Dehumidification in a Chinese Solar Greenhouse Using Dry Outdoor Air Heated by an Active Heat Storage-Release System

Bo Zhou, Yi Zhang, Qichang Yang, Hui Fang, Wei Lu, Sheng Zhou

Institute of Environment and Sustainable Development in Agriculture, Chinese Academy of Agricultural Sciences, China

O-19-05

Real-time Response Curve Estimation of the Canopy Net Photosynthetic Rate to the CO₂ Supply Rate in a Ventilated Greenhouse

Kazuhiro Fujiwara, Yuki Ohshima

Graduate School of Agricultural and Life Sciences, The University of Tokyo, Japan

O-19-06

CFD Simulation of Leakage-induced Inhomogeneity of the Greenhouse Microclimate

Takeshi Kuroyanagi

National Agriculture and Food Research Organization, Japan

13:30–15:00 O-20. Crop Production & Management (III) 306AB

Chair: Chungui Lu

O-20-01

Impact of Different Rhizobial Strains and Reduced N Supply on Growth and Biological N₂-fixation in Cowpea Grown Hydroponically

Georgia Ntatsi, Christina Vrontani, Maria Vlachou, Eleni Rizopoulou, Christos Fotiadis, Andreas Ropokis, Anastasia Tampakaki, Dimitrios Savvas

Department of Crop Science, Agricultural University of Athens, Greece

O-20-02

Melatonin Enhances Photosystem II Electron Transport Via Redox Regulation and D1 Protein Abundance in Salt Stressed Tomato Seedlings

Xiaoting Zhou^{1,2}, Jie Yu^{1,2}, Hailiang Zhao^{1,2}, Kai Cao^{1,2}, Zhirong Zou^{1,2}

¹*College of Horticulture, Northwest A & F University, China*

²*Key Laboratory of Protected Horticultural Engineering in Northwest, Ministry of Agriculture, China*

O-20-03

Increasing Temporal Plant Diversity by Crop Rotation Promoted Crop Productivity through Plant-microbial Feedbacks

Xingang Zhou, Jie Liu, Fengzhi Wu

Department of Horticulture, Northeast Agricultural University, China

O-20-04

Control of Ralstonia Solanacearum in Tomato Hydroponics Using Polyvinylidene Fluoride

Ultra Filtration MembraneMizuho Itoh¹, Yasunaga Iwasaki²¹*Agricultural Production Corporation GRA inc, Japan*²*National Agriculture and Food Research Organization, Japan***O-20-05****Energy Use Efficiency in a Greenhouse Tomato Production in Mexico**Raquel Salazar Moreno, Ana Cristina Sánchez Martínez, Efren Fitz Rodríguez, Irineo López Cruz, Abraham Rojano Aguilar*Autonomous University of Chapingo, Mexico***13:30–15:00 O-21. Plant Factory Technology (III)****307AB****Chair: Kazuhiro Fujiwara****O-21-01****Interaction Effects of Light Intensity and Nitrogen Concentration on Growth, Photosynthetic Characteristics and Quality of Lettuce (*Lactuca Sativa L. Var. Youmaicai*)**Yuming Fu^{1,2,3}, Hongyan Li^{1,2,3}, Juan Yu^{1,2,3}, Hui Liu^{1,2,3}, Zeyu Cao¹, N. S. Manukovsky⁴, Hong Liu^{1,2,3}¹*School of Biological Science and Medical Engineering, Beihang University, China*²*Institution of Environmental Biology and Life Support Technology, Beihang University, China*³*International Joint Research Center of Aerospace Biotechnology & Medical Engineering, Beihang University, China*⁴*Institute of Biophysics (Russian Academy of Sciences, Siberian Branch), Russia***O-21-02****Promote on Hypocotyl Elongation of Squash Rootstock Seedlings Using Blue and Red LEDs**Yuanhao Chen, Ryo Matsuda, Kazuhiro Fujiwara*Graduate School of Agricultural & Life Sciences, The University of Tokyo, Japan***O-21-03****Diagnosing Method for Plant Growth Using 3-D Depth Sensor**Hiroki Umeda, Yuya Mochizuki, Takeshi Saito, Tadahisa Higashide, Yasunaga Iwasaki*Institute of Vegetable and Floriculture Science, National Agriculture and Food Research Organization, Japan***O-21-04****The Recirculated Hydroponic System for Strawberry Nursery Production in Plant Factories**Pei-Chen Huang¹, Wen-Ju Yang¹, Wei Fang²¹*Horticulture and Landscape Architecture Department, National Taiwan University, Chinese Taipei*²*Department of Bio-Industrial Mechatronics Engineering, National Taiwan University, Chinese Taipei*

Poster Presentations

09:10–10:00 Poster Session with Coffee Break

Topic: P-09. Greenhouse System and Design

P-09-01

Towards a Recycling–water Greenhouse: Using Liquid Dessicant Systems to Capture and Recycle Humidity from Plant Transpiration

Ryan Lefers², TorOve Leiknes², Suzana Nunes², NM Srivatsa Bettahalli², Philip Davies³, Nina Fedoroff^{4, 2}

¹*Graduate Student, Saudi Arabia*

²*King Abdullah University of Science and Technology, Saudi Arabia*

³*Aston University, United Kingdom*

⁴*Penn State University, United States*

P-09-02

A New Type Energy Saving Solar Greenhouse with Heat Storage Wall Facility

Chaoxing He, Yansu Li, Xianchang Yu

Institute of Vegetables and Flowers, Chinese Academy of Agricultural Sciences, China

P-09-03

Classification of Anthurium Flower Varieties Using PCA, LDA and K-Nearest Neighbors Algorithms

Alireza Soleimani Pour, Gholamreza Chegini

University of Tehran, Iran

P-09-04

Three–dimensional Reconstruction of Cylindrical Vegetables by Image Processing and B–spline Curves: Eggplants and Cucumbers

Alireza Soleimani Pour, Gholamreza Chegini

University of Tehran, Iran

P-09-05

Variation Features of the Daily Temperature Differences Inside North Wall in Solar Greenhouse During Cold Period

Yanhong Yang, Yaling Li

Shanxi Agricultural University, China

P-09-06

Damage Index Estimation by Analysis of Meteorological Disasters on Film Plastic Greenhouses

Man-kwon Choi, Hee-ryong Ryu, Myeong-whan Cho, In-ho Yu, Young-an Shin

Protected Horticulture Research Institute, National Institute of Horticultural & Herbal Science, Korea

P-09-07

CFD Simulation on Thermal Flow Characteristics in Greenhouse for Microclimate Conditions

SuHa Hwang¹, Hong Jip Kim¹, Sang Min Lee², Young Duk Lee²

¹*Dept. of Mechanical Engineering, Chungnam National University, Korea*

²*Korea institute of machinery & materials, Korea*

P-09-08

Estimation of Heating and Cooling Loads for a Greenhouse in Warm Dry Climates: a Case Study of Varamin Climate

Alireza Soleimani Pour, Gholamreza Chegini

University of Tehran, Iran

P-09-09

Application of Phase Change Energy Storage Technology in Chinese Solar Greenhouse

Yunfei Zhuang, Chengwei Ma, Pingzhi Wang, Jieyu Cheng, Shumei Zhao, Weitang Song

Key Laboratory of Agriculture Engineering in Structure and Environment, China Agricultural University, China

P-09-10

Experimental Study of Thermal Storage Wall with Active Ventilation System by Using Vertical Pipe in Solar Greenhouse

Yanfei Cao, Junxia Zhang, Zhirong Zou, Jianming Li, Zidong Li

Northwest A&F University, China

P-09-11

Analysis of the Daily Temperature Differences Inside North Wall in Solar Greenhouse During Winter and Spring

Yanhong Yang, Yaling Li, Yujing Ma, Xiangzhen Wen

College of Horticulture, Shanxi Agricultural University, China

P-09-12

Development of System Measuring Realtime Air Flow in Greenhouse

Jeongmin Lee, Yuyong Kim

Dept. of Agricultural Engineering, National Institute of Agricultural Sciences, Korea

P-09-13

Energy Simulation Tool for Active Solar Collector Greenhouses

Ingo Schuch¹, Luis Miranda¹, Tundra Ramírez², Hans-Peter Kläring², Uwe Schmidt¹

¹*Humboldt University of Berlin, Germany*

²*Leibniz Institute of Vegetable and Ornamental Crops, Germany*

P-09-14

Comparison of Solar Transmittance through Greenhouse Covering by Diffuse and Clear Films

Maro Tamaki, Takae Usui, Tadashi Takakura

Okinawa Agricultural Research Center, Japan

P-09-15

Analysis of Temperature, Humidity Distributions and Energy Consumption According to Using Air Circulation Fans in Greenhouse

Taeseok Lee, Geumchoon Kang, Jinkyung Kwon, Hyungkwon Kim, Jongpil Moon, Sungsik Oh

National Institute of Agricultural Science, Korea

P-09-16

Computational Modelling of Greenhouse Design Parameters From Energy Conservation Point of View

Hyun Woo Lee¹, Adnan Rasheed¹, Jong Won Lee², Wook Ho Na¹, Yong Hyeok Choi³

¹*Dep. of Agricultural Engineering, Kyungpook National University, Korea*

²*Institute of Agricultural Science & Technology, Kyungpook National University, Korea*

³*R&D Team, S Polytech Co. Ltd., Korea*

P-09-17

Dynamic Analysis of Single-span Film Plastic Greenhouse with Joint in Rafter

Ryu Hee-ryong, Man-kwon Choi, Myeong-whan Cho, In-ho Yu, Young-an Shin

Protected Horticulture Research Institute, National Institute of Horticultural & Herbal Science, Korea.

P-09-18

Experimental Study on Thermal Property for a Chinese Solar Greenhouse Concrete Wall

Yuqing Zhang

Shenyang Agricultural University, China

P-09-19

Prototype Greenhouse Blind-type Shading System Using a Semi-transparent Photovoltaic Module

Zhi Li¹, Akira Yano², Marco Cossu², Yasunori Katsumata¹, Tetsuo Matsuoka¹, Hidetoshi Nakamura³, Toshinori Matsumoto³, Josuke Nakata³

¹*Shimane University, Japan*

²*Faculty of Life and Environmental Science, Shimane University, Japan*

³*Sphelar Power Corporation, Japan*

P-09-20

Higher Plants Compartment Development for Closed Regenerative Life Support System (Space Application): Status and Challenges

Christel Paille¹, Claude-Gilles Dussap², Mike Dixon³, Danny Geelen⁴, Lorenzo Bucchieri⁵, Stefania De Pascale⁶, Christophe Lasseur¹

¹*European Space Agency, France*

²*University Blaise Pascal, France*

³*University of Guelph, Canada*

⁴*Ghent University, The Netherlands*

⁵*EnginSoft*

⁶*University of Naples Federico II, Italy*

August 23

Topic: P-10. Climate Control & Modeling

P-10-01

Circulation Fan Effects Environmental Parameter and Tomato Growth in Chinese Solar Greenhouse

Yue Zhang, Shumei Zhao, Xiaolong Feng, Qingrong Wang, Xiaomeng Ren

Key Laboratory of Agriculture Engineering in Structure and Environment, China Agricultural University, China

P-10-02

Liquid Desiccant Cooling of Greenhouses through Solar Regeneration of Seawater Desiccants

Philip A. Davies¹, Opubo Igobo¹, Sotos Generalis¹, Esam Elsarrag²

¹*Aston University, United Kingdom*

²*Gulf Organisation for Research and Development, Qatar*

P-10-03

Adapting to Climate Change with Innovative Greenhouse Technologies

Nazim Gruda, Mehdi Bisbis, Michael Blanke

University of Bonn, Germany

P-10-04

Solar-powered Cooling Systems for Combined Food and Water Production in Greenhouses

Philip A. Davies¹, Jose Antonio Andrés-Mañas², Opubo Igobo¹, Guillermo Zaragoza²

¹*Sustainable Environment Research Group, School of Engineering and Applied Science, Aston University, United Kingdom*

²CIEMAT - Plataforma Solar de Almería, Spain

P-10-05

Comparative Analysis of the Chloroplast Proteomes of Cucumber (*Cucumis Sativus* L.) under Different CO₂ Concentration and Water Treatment

Qingqing Cui, Qingming Li

College of Horticulture Science and Engineering, Shandong Agricultural University, China

P-10-06

Design of Intelligent Heating Control System of Energy-Saving Solar Greenhouse

Zhihong Gong¹, Chaoyang Dong¹, Hong Yu², Zhenfa Li¹, Qingyu Xue¹

¹Tianjin Climate Center, China

²Wuqing Meteorological Administration, China

P-10-07

Effect of Airflow Control on Temperature Distributions in a Greenhouse with a Pad-pan Evaporative Cooling System

Takayuki Tokairin¹, Akihiro Sumi¹, Tadashi Kumazaki¹, Kuninori Suzuki²

¹Toyohashi University of Technology, Japan

²Inochio Holdings Inc., Japan

P-10-08

Measurement of Diffuse Solar Radiation in a Greenhouse with Saw-tooth Roof

Hiroshi Abe¹, Takayuki Tokairin¹, Tadashi Kumazaki¹, Yusuke Ohtsuki², Yuichiro Okuda³, Naoki Ohishi⁴

¹Toyohashi University of Technology, Japan

²Toyotane Co.ltd, Japan

³Denso Corporation, Japan

⁴Shizuoka Prefecture, Japan

P-10-09

Research on Information Fusion of WSNs for Greenhouse Climate Measurement

Jizhang Wang¹, Jinsheng Zhou¹, Tong He¹, Pingping Li^{1,2}

¹Key Laboratory of Modern Agricultural Equipment and Technology, Ministry of Education & Jiangsu Province, Jiangsu University, China

²College of Biology and the Environment, Nanjing Forestry University, China

P-10-10

Monitoring and Modelling Plant Growth in Ornamentals (*Rosa* 'Kordana' and *Ficus benjamina*)

Bert Schamp¹, H. A. L. Van de Put², F. S. Lauriks², Dr. Ir. D. J. W. De Pauw^{2,3}, M-C Van Labeke⁴, K. Steppe², B. Gobin¹

¹ Ornamental Plant Research (PCS), Belgium

² Laboratory of Plant Ecology, Department of Applied Ecology and Environmental Biology, Faculty of Bioscience Engineering, Ghent University, Belgium

³ Phyto-IT, Mariakerke, Belgium

⁴ Department of Plant Production, Faculty of Bioscience Engineering, Ghent University, Belgium

P-10-11

Towards Generalization with Neural Networks: Testing a Climate Model with a Second Greenhouse

Luis Miranda¹, Bruno Lara², Uwe Schmidt¹

¹ Fachgebiet Biosystemtechnik, Humboldt-Universität zu Berlin, Germany

² Centro de Investigación en Ciencias, Universidad Autónoma del Estado de Morelos, Mexico

P-10-12

Activ-passive Solar Triple Wall with Phase Change Material and Its Effectiveness on The Improvement of Thermal Environment in Solar Greenhouse

Chao Chen, Haoshu Ling, Nan Yu, Mingxing Zhang, Yin Li, Fengguang Yang, Lixing Jiang, Chao Sun

College of Architecture and Civil Engineering, Beijing University of Technology, China

P-10-13

CFD Applications for Chinese Solar Greenhouses

Guohong Tong

College of Water Conservancy, Shenyang Agricultural University, China

P-10-14

Advanced Climate Control Systems

Barak Mordechay, Lidor Guy, Shkaliar Alexander, Arbel Abraham

Institute for Agricultural Engineering, Agricultural Research Organization (ARO)–the Volcani Center, Israel

P-10-15

Performance of a Solid Adsorptive Dehumidification System in Chinese Solar Greenhouse

Hao Liang, Mingchi Liu, Yanhai Ji, Zhanhui Wu, Chao Xu, Wei Liu, Jiayi Xing, Pingbin Yu

Beijing Vegetable Research Center of Beijing Academy of Agriculture and Forestry Sciences, China

P-10-16

Numerical Simulation of Thermal Behavior in a Chinese Solar Greenhouse

Hui Fang, Qichang Yang, Yi Zhang, Ruifeng Cheng

Institute of Environment and Sustainable Development in Agriculture, Chinese Academy of Agricultural Sciences, China

P-10-17

Sun-tracking Multi-layer Stereo-cultivation System Improves Light and Temperature of Strawberry & Increase Production

Chunling Wang^{1,2}, Weitang Song^{1,3}, Shumei Zhao^{1,3}, Mingshan Qu⁴

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P-10-18

Model Recalibration As a Way to Estimate Slow State Variable (Leaf Area Index) Using Fast State Ones (Climate Variables)

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P-10-19

An Early Warning Model of Greenhouse Tomato Diseases Applied on Fuzzy-PID Control for Greenhouse Climate Decision

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Topic: P-11. Product Quality

P-11-01

Quality Perception and Willingness to Pay for Lettuce from Controlled Environments in Trinidad and Tobago

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P-11-02

Controlling Humidity in Above-ground and Below-ground Environments Can Prevent Occurrence of Blossom End Rot in Tomato Plants

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P-11-03

Configuration of Hydroponically Basil Nutritional Quality in Response to Salinity and Growing Seasons

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P-11-04

Analysis of the Growth and Glucosinolate Contents of Nasturtium Officinale According to LED Lights in a Hydroponic Culture System

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Effects of Various Ratios of Red and Blue Light on the Growth, β -carotene and Lutein Contents of Kale

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P-11-06

Volatile Compound Characterization of a Novel Variety Melon 'Flavor No.4'

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P-11-07

Analysis on Eco-organic Soilless Culture Formula with Total Nutrient in Tomato Production

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P-11-08

Non-destructive Estimation of Internal time Information of Perilla Using Hyperspectral Data and Machine Learning

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P-11-09

Effects of Supplemental Intracanopy LED Lighting on the Nutritive Attributes and Post-harvest Quality of Greenhouse Tomato

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