

## Scientific Program, July, 20

### Oral presentations

9:30 – 10: 45 – Invited speaker	Auditorium
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#### INNOVATIONS IN GREENHOUSE SYSTEMS – ENERGY CONSERVATION BY SYSTEM DESIGN, SENSORS AND DECISION SUPPORT SYSTEMS

S. Hemming

*Wageningen University*

10:45 – 12:30 – Oral session O1. Light use in greenhouses I	R110
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Chair: E. Goto

OS1.1 **MOBILE SHADING VERSUS WHITEWASHING: EVALUATION OF THE AGRONOMIC RESPONSE OF A TOMATO CROP**

M. Luisa García-Balaguer<sup>1</sup>, M.C. Sánchez-Guerrero<sup>1</sup>, E. Medrano<sup>1</sup>, E. J. Baeza<sup>1</sup>, M. J. Sánchez-González<sup>1</sup>, M.E. Porras<sup>1</sup>, M.Giménez<sup>1</sup>, P. Lorenzo<sup>1</sup>

<sup>1</sup>*IFAPA, Spain*

OS1.2 **EFFECTS OF DIURNAL CHANGE IN SPECTRAL DISTRIBUTION OF LIGHT PROVIDED BY LEDS ON MORPHOLOGY AND GROWTH OF COS LETTUCE PLANTS**

T. Jishi<sup>1</sup>, R. Matsuda<sup>1</sup>, K. Fujiwara<sup>1</sup>

<sup>1</sup>*The University of Tokyo, Japan*

OS1.3 **ENERGY EFFICIENCY OF GREENHOUSE CUCUMBER PRODUCTION UNDER LED AND HPS LIGHTING**

T. Kaukoranta<sup>1</sup>, L. Särkkä<sup>1</sup>, K. Jokinen<sup>1</sup>

<sup>1</sup>*MTT Agrifood Research, Finland*

OS1.4 **OPTIMAL LIGHT INTENSITY FOR IMPROVING ELECTRIC-ENERGY UTILIZATION EFFICIENCY AND QUALITY OF LETTUCE IN A PLANT FACTORY WITH ARTIFICIAL LIGHT**

J. Wang<sup>1</sup>, Q. Yang<sup>1</sup>, Y. Tong<sup>1</sup>

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

OS1.5 **DYNAMIC TEMPERATURE INTEGRATION WITH TEMPERATURE DROP IMPROVED THE RESPONSE OF GREENHOUSE TOMATO TO LONG PHOTOPERIOD OF SUPPLEMENTAL LIGHTING**

X. Hao<sup>1</sup>, X. Guo<sup>2</sup>, X. Chen<sup>3</sup>, S. Khosla<sup>4</sup>

<sup>1</sup>*Greenhouse and Processing Crops Research Centre, Agriculture and Agri-Food Canada*

<sup>2</sup>*Greenhouse and Processing Crops Research Centre, Agriculture and Agri-Food Canada,*

<sup>3</sup>*University of Windsor, Canada,* <sup>4</sup>*Ontario Ministry of Agriculture Food and Ministry of Rural Affairs, Greenhouse and Processing Crops Research Centre, Canada*

10:45 – 12:30 – Oral session O2. Greenhouse systems and design I	R115
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Chair: H. Fatnassi

OS2.1 **ADAPTIVE GREENHOUSE DESIGN: WHAT IS BEST FOR GROWING TOMATO IN NORTHERN AFRICA?**

C. Stanghellini<sup>1</sup>, F. de Zwart<sup>1</sup>

<sup>1</sup>*Wageningen UR Greenhouse Horticulture, The Netherlands*

**OS2.2 IMPROVEMENT OF GREENHOUSE DESIGN AND CLIMATE CONTROL IN MEDITERRANEAN CONDITIONS**

Y. Tuzel<sup>1</sup>, H.F. de Zwart<sup>2</sup>, A. Sapounas<sup>2</sup>, C. Stanghellini<sup>2</sup>, S. Hemming<sup>2</sup>

<sup>1</sup>Ege University, Faculty of Agriculture, Department of Horticulture, Turkey, <sup>2</sup>Wageningen UR Greenhouse Horticulture, The Netherlands

**OS2.3 LOCAL CLIMATE, TECHNOLOGY AND WATER USE EFFICIENCY IN GREENHOUSES**

N. Katsoulas<sup>1</sup>, A. Sapounas<sup>2</sup>, F. de Zwart<sup>2</sup>, A. Dieleman<sup>2</sup>, C. Stanghellini<sup>2</sup>

<sup>1</sup>University of Thessaly, Greece, <sup>2</sup>Wageningen UR Greenhouse Horticulture, The Netherlands

**OS2.4 DEVELOPMENT OF A BUILDING-INTEGRATED ROOF TOP GREENHOUSE SYSTEM (I-RTG) IN BARCELONA (SPAIN).**

J.I. Montero<sup>1</sup>, P. Muñoz<sup>1</sup>, E. Sanyé-Mengual<sup>2</sup>, P. Llorach<sup>2</sup>, J. Rieradevall<sup>2</sup>

<sup>1</sup>IRTA, Spain <sup>2</sup>ICTA, Spain

**OS2.5 EVALUATING ENVIRONMENTAL CONDITIONS IN OPEN-ROOF GREENHOUSES**

M. Ishii<sup>1</sup>, L. Okushima<sup>1</sup>, H. Moriyama<sup>1</sup>, S. Sase<sup>2</sup>, T. Maruo<sup>3</sup>, N. Fukuchi<sup>4</sup>, A.J. Both<sup>5</sup>

<sup>1</sup>National Institute for Rural Engineering, National Agricultural and Food Research Organization, Ibaraki, Japan, <sup>2</sup>College of Bioresource Sciences, Nihon University, Kanagawa, Japan, <sup>3</sup>Graduate school of Horticulture, Chiba University, Chiba, Japan, <sup>4</sup>Chiba Prefectural Agriculture and Forestry Research Center, Chiba, Japan, <sup>5</sup>Department of Environmental Sciences, Rutgers University, New Jersey, USA

10:45 – 12:30 – Oral session O3. Covering Materials I

R131

Chair: Y. Shahak

**OS3.1 AERODYNAMIC CHARACTERISATION OF TWO LARGE SCREENHOUSE ROOFS**

I. Seginer<sup>1</sup>, M. Pirkner<sup>2</sup>, O. Achiman<sup>2</sup>, Y. Mekhmandarov<sup>2</sup>, J. Tanny<sup>2</sup>

<sup>1</sup>Technion, Israel, <sup>2</sup>ARO, Israel

**OS3.2 THE EFFECT OF STRUCTURE TYPE ON THE VALIDITY OF TURBULENT FLUX MEASUREMENTS BY THE EDDY COVARIANCE TECHNIQUE**

O. Achiman<sup>1</sup>, Y. Mekhmandarov<sup>1</sup>, M. Pirkner<sup>1</sup>, J. Tanny<sup>1</sup>

<sup>1</sup>ARO, Israel

**OS3.3 REGULATED TRANSPARENT INSULATION FOR GREENHOUSE COVERS THROUGH THE USE OF TAILOR-MADE BIMODAL NANOPARTICLE FORMATIONS**

A. Kavga<sup>1</sup>, N. Angastiniotis<sup>2</sup>, G. Trypanagnostopoulos<sup>3</sup>, S. Pantelakis<sup>3</sup>

<sup>1</sup>Technological Education Institute of Western Greece, Patras, Greece, <sup>2</sup>Cyprus University of Technology, Lemesos, Cyprus, <sup>3</sup>University of Patras, Patras, Greece

**OS3.4 RADIOMETRIC PROPERTIES, VINE PHYSIOLOGY AND YIELD PARAMETERS OF IRRIGATED SUBLIMA TABLE GRAPE UNDER DIFFERENT PLASTIC FILMS IN SOUTH ITALY**

L. Tarricone<sup>1</sup>, G. Gentile<sup>1</sup>, D. Di Gennaro<sup>1</sup>, A. M. Amendolagine<sup>1</sup>, L. De Palma<sup>2</sup>, G. Vox<sup>3</sup>, G.S. Mugnozza<sup>3</sup>, E. Schettini<sup>3</sup>

<sup>1</sup>Consiglio per la Ricerca e la Sperimentazione in Agricoltura - Research Unit for Viticulture and Enology in Southern Italy, Turi (BA), Italy, <sup>2</sup>Department of Science of Agriculture, Food and Environments, University of Foggia, Foggia, Italy, <sup>3</sup>Department of Agricultural and Environmental Science, University of Bari, Bari, Italy

Chair: C. Kittas

**OS4.1 COMPARISON OF LIGHTING SYSTEMS ON THE GROWTH AND FLOWERING OF CHRYSANTHEMUM**

T. Dueck<sup>1</sup>, E. Meinen<sup>1</sup>, F. Kempkes<sup>1</sup>

<sup>1</sup>Wageningen UR Greenhouse Horticulture, The Netherlands

**OS4.2 EVALUATING THE EFFECTIVENESS OF WHITE LIGHT-EMITTING DIODE LAMPS ON FLOWERING CONTROL OF PHOTOPERIODIC ORNAMENTAL CROPS**

Q. Meng<sup>1</sup>, E.S. Runkle<sup>1</sup>

<sup>1</sup>Michigan State University, USA

**OS4.3 LIGHT SPECTRAL EFFECTS ON PHENOLIC COMPOUNDS IN PERILLA FRUTESCENS LEAVES AS RELATED TO THE LEAF AGE, COLOR AND DURATION OF EXPOSURE**

A. Viršilė<sup>1</sup>, A. Brazaitytė<sup>1</sup>, R. Sirtautas<sup>1</sup>, P. Duchovskis<sup>1</sup>

<sup>1</sup>Lithuanian Research Centre for Agriculture and Forestry, Institute of Horticulture, Lithuania

**OS4.4 ESTIMATION OF CANOPY PHOTOSYNTHESIS OF PAPRIKA WITH 3-D RAY-TRACING SIMULATION AND CO2 MEASUREMENT**

J.E. Son<sup>1</sup>, J.H. Kim<sup>1</sup>

<sup>1</sup>Seoul National University, Korea

Chair: F. Kempkes

**OS5.1 PRECISE ENVIRONMENTAL CONTROL ALGORITHM IN GREENHOUSE USING SENSOR-NETWORK SYSTEM**

I.H. Seo<sup>1</sup>, W.G. Bae<sup>1</sup>, S.P. Kim<sup>1</sup>

<sup>1</sup>Research Institute of Green Eco Engineering, Seoul National University, Korea

**OS5.2 THE LOW ENERGY GREENHOUSE - HEAT TRANSFER BY LONG WAVE RADIATION**

H. Tantau<sup>1</sup>

<sup>1</sup>Leibniz University Hannover, Germany

**OS5.3 OPTIMIZATION OF SOLAR ENERGY STORAGE SYSTEM INSIDE A GREENHOUSE**

G.K. Ntinis<sup>1</sup>, V.P. Fragos<sup>1</sup>, C. Nikita-Martzopoulou<sup>1</sup>

<sup>1</sup>Aristotle University of Thessaloniki, Greece

**OS5.4 IS IT TIME FOR PHOTOVOLTAIC GREENHOUSES ?**

R. Suay<sup>1</sup>, C. Poncet<sup>1</sup>, H. Fatnassi<sup>1</sup>

<sup>1</sup>INRA- UMR ISA 1355 TEAPEA, France

**OS5.5 THE NEXT GENERATION OF MICROALGAE PRODUCTION SYSTEMS UNDER PHOTOVOLTAIC GREENHOUSES**

O. Bernard<sup>1</sup>, R. Suay<sup>2</sup>, Q. Bechet<sup>1</sup>, C. Poncet<sup>2</sup>, H. Fatnassi<sup>2</sup>, F. Mairet<sup>1</sup>, A. Sciandra<sup>3</sup>, A. Mangin<sup>4</sup>, D. Coulon<sup>5</sup>, R. Boubekri<sup>5</sup>

<sup>1</sup>INRIA-BIOCORE, France, <sup>2</sup>S/S, <sup>3</sup>CNRS-LOV, UMR 7093, <sup>4</sup>ACRI-ST, <sup>5</sup>SunPartner Technologies

14:30 – 16:10 – Oral session O6. Covering Materials II and Semi-protected cultivation systems	R131
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Chair: E. Schettini

- OS6.1 **PEARL NETTING CAN IMPROVE PHOTOSYNTHETIC LIGHT USE ASSOCIATED WITH MODIFICATION OF LEAF STRUCTURAL AND PHYSIOCHEMICAL TRAITS IN SWEET PEPPER**  
Y. Kong<sup>1</sup>, L. Avraham<sup>2</sup>, K. Ratner<sup>3</sup>, Y. Shahak<sup>3</sup>  
<sup>1</sup>*School of Environmental Sciences, University of Guelph, Guelph, Ontario, Canada,* <sup>2</sup>*Ministry of Agriculture Extension Services (Shaham), Bet-Dagan, Israel,* <sup>3</sup>*Institute of Plant Sciences, ARO The Volcani Center, Bet-Dagan, Israel*
- OS6.2 **PHOTOSELECTIVE NETTING OF FRUIT-TREES: COMMON RESPONSES VS. CROP-SPECIFIC VARIABILITY**  
Y. Shahak<sup>1</sup>  
<sup>1</sup>*Institute of Plant Sciences, ARO The Volcani Center, Bet-Dagan, Israel*
- OS6.3 **TOP PHOTOSELECTIVE NETTING RESULTS IN IMPROVED MICROCLIMATE, PRODUCTIVITY, PHYSIOLOGICAL PERFORMANCE AND WATER-USE EFFICIENCY IN CITRUS**  
D.B. Nemera, N. Zur, V. Lukyanov, L. Shlizerman, K. Ratner, Y. Shahak, S. Cohen, A. Sadka  
*ARO, The Volcani Center, Israel*
- OS6.4 **SUMMER PRODUCTION OF HIGH SOLUBLE SOLID CONTENT TOMATO BY THE SIMPLE AND LOW COST NUTRICULTURE SYSTEM IN HOKKAIDO**  
T. Jishi<sup>1</sup>, T. Komatsu<sup>2</sup>, S. Yasuoka<sup>3</sup>  
<sup>1</sup>*Kamikawa Agricultural Experiment Station, Pippu, Hokkaido, Japan,* <sup>2</sup>*Central Agricultural Experiment Station, Naganuma, Hokkaido, Japan,* <sup>3</sup>*Tokachi Agricultural Experiment Station, Memuro, Hokkaido, Japan*

## Poster presentations

16:30 – 17:30 – Poster session I	R129
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Light use in greenhouses
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- PS1.1 **NARROW-BAND LIGHTING COMBINED WITH SHORT PHOTOPERIODS AS A WAY OF CONTROLLING GROWTH AND SHAPE IN GREENHOUSE GROWN ORNAMENTALS**  
K.J. Bergstrand<sup>1</sup>, H. Asp<sup>1</sup>, H.K. Schüssler<sup>1</sup>  
<sup>1</sup>*Dept. of Biosystems and Technology, Swedish University of Agricultural Sciences, Sweden*
- PS1.2 **DIFFERENT LIGHT SPECTRA IS AFFECTING GROWTH AND MORPHOLOGY OF TRANSPLANTS OF SOLANUM LYCOPERSICUM**  
K.J. Bergstrand<sup>1</sup>, H. Asp<sup>1</sup>, H.K. Schüssler<sup>1</sup>  
<sup>1</sup>*Dept. of Biosystems and Technology, Swedish University of Agricultural Sciences, Sweden*
- PS1.3 **INFLUENCE OF LIGHT AND TEMPERATURE ON FLOWER DEVELOPMENT IN GERBERA**  
T. Dueck<sup>1</sup>, F. Kempkes<sup>1</sup>, F. van der Helm<sup>1</sup>, M. de Groot<sup>2</sup>  
<sup>1</sup>*Wageningen UR Greenhouse Horticulture, The Netherlands* <sup>2</sup>*FloriConsultGroup, Woerden, The Netherlands*
- PS1.4 **A COMPARISON OF HERBS AND LEAFY VEGETABLES GROWTH UNDER DIFFERENT ENERGY EFFICIENT LED LIGHT REGIMES**  
I. Fällström<sup>1</sup>, D. Bänkestad<sup>1</sup>, G.M. Bochenek<sup>1</sup>  
<sup>1</sup>*Heliospectra AB, Gothenburg, Sweden*

- PS1.5 EVALUATION OF SUMMER LIGHT INTENSITY BETWEEN THE EAST AND WEST SIDES OF A TWIN-SPAN GLASSHOUSE**  
 L.H. Chen<sup>1</sup>, T.C. Shen<sup>2</sup>, W.Y. Chen<sup>2</sup>, J.Y. Chen<sup>3</sup>, C. Chen<sup>3</sup>, J. Hughes<sup>2</sup>  
<sup>1</sup>Taichung District Agricultural Research and Extension Station, Council of Agriculture, Taiwan,  
<sup>2</sup>AVRDC – The World Vegetable Center, Shanhua, Tainan, Taiwan, <sup>3</sup>Dpt. of Bio-industrial  
 Mechatronics Engineering, National ChungHsing University, Taiwan
- PS1.6 EFFECTS OF CONTINUOUS LED LIGHT EXPOSURE ON CHLOROPHYLL FLUORESCENCE, NITRATE CONTENT AND PHYTOCHEMICALS IN LETTUCES**  
 Z. Bian<sup>1</sup>, C. Lu<sup>1</sup>, Q. Yang<sup>1</sup>, R. Cheng<sup>1</sup>, W. Liu<sup>1</sup>  
<sup>1</sup>Institute of Environment and Sustainable Development in Agriculture, Chinese Academy of  
 Agricultural Science, Beijing, China
- PS1.7 LIGHT COMPETITION BETWEEN NEIGHBORING PLANTS IS REDUCED BY GROWING UNDER ILLUMINATION WITH HIGH RED TO FAR-RED RATIO**  
S. Kishigami<sup>1</sup>, T. Shibuya<sup>1</sup>, R. Endo<sup>1</sup>, Y. Kitaya<sup>1</sup>  
<sup>1</sup>Osaka Prefecture University, Japan
- PS1.8 THE EFFECT OF DIFFERENT TYPE ILLUMINATION ON GROWTH AND NUTRITIONAL QUALITY OF TATSOI MICROGREENS**  
A. Brazaitytė<sup>1</sup>, G. Samuolienė<sup>2</sup>, J. Jankauskienė<sup>2</sup>, S. Sakalauskienė<sup>2</sup>, A. Novičkovas<sup>3</sup>, L.  
 Dabašinskas<sup>3</sup>, V. Vaštakaitė<sup>2</sup>, A. Viršilė<sup>2</sup>, R. Sirtautas<sup>2</sup>, J. Miliauskienė<sup>2</sup>, P. Duchovskis<sup>2</sup>  
<sup>1</sup>Lithuanian Research Centre for Agriculture and Forestry, Institute of Horticulture, Lithuania,  
<sup>2</sup>Lithuanian Research Centre for Agriculture and Forestry, Institute of Horticulture, Lithuania,  
<sup>3</sup>Vilnius University, Institute of Applied Research, Lithuania
- PS1.9 CULTIVATION OF SWEET PEPPER (CAPSICUM ANNUUM L.) TRANSPLANTS USING SOLID-STATE AND HIGH-PRESSURE SODIUM LAMPS**  
A. Brazaitytė<sup>1</sup>, A. Bagdonavičienė<sup>1</sup>, J. Jankauskienė<sup>1</sup>, G. Samuolienė<sup>1</sup>, A. Viršilė<sup>1</sup>, R. Sirtautas<sup>1</sup>, S.  
 Sakalauskienė<sup>1</sup>, J. Miliauskienė<sup>1</sup>, N. Maročkienė<sup>1</sup>, P. Duchovskis<sup>1</sup>  
<sup>1</sup>Lithuanian Research Centre for Agriculture and Forestry, Institute of Horticulture, Lithuania
- PS1.10 GRAFT-TAKING CHARACTERISTICS OF GRAFTED CUCUMBER SEEDLINGS AS AFFECTED BY DIFFERENT LIGHT QUALITY, LIGHT INTENSITY AND DUTY RATIO OF LED LAMPS**  
 H.G. Kim<sup>1</sup>, J.S. Lee<sup>1</sup>, T.G. Lim<sup>1</sup>, Y.H. Kim<sup>1</sup>  
<sup>1</sup>Chonbuk National University, Korea
- PS1.11 THE EFFECT OF IRRADIATION WITH RED LIGHT SUPPLEMENTED WITH ULTRAVIOLET A ON VINBLASTINE ACCUMULATION IN CATHARANTHUS ROSEUS LEAVES**  
T. Fukuyama<sup>1</sup>, K. Ohashi-Kaneko<sup>2</sup>, K. Hirata<sup>3</sup>, K. Harada<sup>3</sup>, M. Muraoka<sup>3</sup>, H. Watanabe<sup>1</sup>  
<sup>1</sup>Graduate School of Agriculture, Tamagawa University, Machida, Japan, <sup>2</sup>Research institute,  
 Tamagawa University, Machida, Japan, <sup>3</sup>Graduate School of Pharmaceutical Sciences, Osaka  
 University, Suita, Japan
- PS1.12 MEASURING METHOD FOR PHOTOSYNTHETIC PHOTON FLUX DENSITY USING A DIGITAL CAMERA**  
A. Sato<sup>1</sup>, M. Tsukada<sup>1</sup>  
<sup>1</sup>NEC, Japan
- PS1.13 STIMULATING HEALTH PROMOTING COMPOUNDS OF GREENHOUSE GROWN TOMATO FRUITS WITH SOLID STATE LIGHTING (SSL) MODULES**  
 X. Aranda<sup>1</sup>, P. Muñoz<sup>1</sup>, J.I. Montero<sup>1</sup>  
<sup>1</sup>IRTA, Spain

- PS1.14 **SEASONAL PROFILES OF ASCORBIC ACID CONTENTS IN MICROGREENS CULTIVATED UNDER SUPPLEMENTAL BLUE AND GREEN LIGHT IN GREENHOUSE**  
A. Viršilė<sup>1</sup>, A. Brazaitytė<sup>1</sup>, G. Samuolienė<sup>1</sup>, S. Sakalauskienė<sup>1</sup>, J. Jankauskienė<sup>1</sup>, R. Sirtautas<sup>1</sup>, V. Vaštakaitė<sup>1</sup>, A. Novičkovas<sup>2</sup>, P. Duchovskis<sup>1</sup>  
<sup>1</sup>*Lithuanian Research Centre for Agriculture and Forestry, Institute of Horticulture, Lithuania,*  
<sup>2</sup>*Vilnius University, Institute of Applied Research, Lithuania*
- PS1.15 **YIELD AND FRUIT QUALITY OF SEVERAL WILD AND DOMESTIC TOMATO CULTIVARS GROWN IN AN ENVIRONMENTALLY CONTROLLED AGRICULTURAL FACILITY (PLANT FACTORY)**  
K. Ohashi-Kaneko<sup>1</sup>, W. Imai<sup>2</sup>, T. Tabushi<sup>3</sup>, T. Kobayashi<sup>3</sup>, H. Watanabe<sup>3</sup>  
<sup>1</sup>*Research institute, Tamagawa University, Tokyo, Japan,* <sup>2</sup>*Faculty of Agriculture, Tamagawa University, Tokyo, Japan,* <sup>3</sup>*Faculty of Agriculture, Graduate School of Tamagawa University, Tokyo, Japan*
- PS1.16 **RESPONSE OF GREENHOUSE TOMATO TO DIFFERENT VERTICAL SPECTRA OF LED LIGHTING UNDER TOP HIGH PRESSURE SODIUM AND PLASMA LIGHTING**  
X. Hao<sup>1</sup>, X. Guo<sup>2</sup>, X. Chen<sup>3</sup>, S. Khosla<sup>4</sup>  
<sup>1</sup>*Greenhouse and Processing Crops Research Centre, Agriculture and Agri-Food Canada, Ontario, Canada,* <sup>2</sup>*Greenhouse and Processing Crops Research Centre, Agriculture and Agri-Food Canada, Canada,* <sup>3</sup>*University of Windsor, Canada,* <sup>4</sup>*Ontario Ministry of Agriculture Food and Ministry of Rural Affairs, Greenhouse and Processing Crops Research Centre, Ontario, Canada*
- PS1.17 **A DIFFERENCE IN NET PHOTOSYNTHETIC RATE BETWEEN LEAVES GROWN WITH AND WITHOUT FAR-RED LIGHT DEPENDS ON THE SPECTRAL DISTRIBUTION OF MEASURING LIGHT**  
K. Murakami<sup>1</sup>, R. Matsuda<sup>1</sup>, K. Fujiwara<sup>1</sup>  
<sup>1</sup>*Graduate School of Agricultural and Life Sciences, The University of Tokyo, Japan*
- PS1.18 **ESTIMATION OF SPATIAL LIGHT DISTRIBUTION IN GREENHOUSE AND CANOPY LIGHT INTERCEPTION BY 3-D MODEL**  
J.W. Lee<sup>1</sup>, J.H. Shin<sup>1</sup>, T.I. Ahn<sup>1</sup>, W.H. Kang<sup>1</sup>, J.E. Son<sup>1</sup>  
<sup>1</sup>*Department of Horticultural Science, Seoul National University, Seoul, Korea*
- PS1.19 **ESSENTIAL OIL COMPONENTS ACCUMULATION IN SWEET BASIL PLANTS AS AFFECTED BY LED RADIATION**  
A.S. Ivanitskikh<sup>1</sup>, I.G. Tarakanov<sup>1</sup>  
<sup>1</sup>*Russian State Agrarian University - Moscow Timiryazev Agricultural Academy, Russia*
- PS1.20 **SUPPLEMENTAL LIGHTING FOR GREENHOUSE-GROWN STRAWBERRIES: EFFECTS OF DIFFERENT RATIOS OF RED TO BLUE LED RADIATION**  
M. Yakovtseva<sup>1</sup>, G. Govorova<sup>1</sup>, I. Tarakanov<sup>1</sup>  
<sup>1</sup>*Russian State Agrarian University — Moscow Timiryazev Agricultural Academy, Russia*
- PS1.21 **PROLINE TEST TO EVALUATE LIGHT STRESS IN TOMATO SEEDLINGS UNDER ARTIFICIAL LIGHT**  
E.M. Almansa<sup>1</sup>, R.M. Chica<sup>1</sup>, B.M. Plaza<sup>1</sup>, M.T. Lao<sup>1</sup>  
<sup>1</sup>*University of Almeria, Spain*

#### Greenhouse systems and design

- PS1.22 **INFLUENCE OF GEOMETRY ON SHADING EFFECT INSIDE PHOTOVOLTAIC GREENHOUSES**  
S. Castellano<sup>1</sup>  
<sup>1</sup>*University of Foggia, Italy*

- PS1.23 **DESIGN OF LARGE-SCALE SOLAR GREENHOUSE AND ITS PERFORMANCE IN WINTER**  
 S. Zhou<sup>1</sup>, Y. Zhang<sup>1</sup>, Q. Yang<sup>1</sup>, H. Fang<sup>1</sup>  
<sup>1</sup>*Institute of Environment and Sustainable Development in Agriculture, Chinese Academy of Agricultural Sciences, China*
- PS1.24 **SOLNOVA GREENHOUSE STRUCTURE**  
G. Lopez Diaz<sup>1</sup>, M.C. Galera Quiles<sup>1</sup>, M.M. Villegas Oliva<sup>1</sup>, A. Carreño Ortega<sup>2</sup>  
<sup>1</sup>*CT Tecnova, Spain*, <sup>2</sup>*Universidad de Almeria, Spain*
- PS1.25 **THE EFFECT OF NET HOUSE WHICH PROTECTS CROPS AND STRUCTURES AGAINST SALTY WATER AND STRONG WIND DUE TO TYPHOONS**  
M. Tamaki<sup>1</sup>, T. Usui<sup>2</sup>, T. Takakura<sup>1</sup>  
<sup>1</sup>*Okinawa Agricultural Resurch Center, Japan*, <sup>2</sup>*Global Blains Co. Ltd., Japan*
- PS1.26 **INFLUENCE OF THE GREENHOUSE TYPE AND COOLING SYSTEM ON THE PRODUCTION OF A TOMATO CROP DURING THE SPRING/SUMMER CYCLE UNDER MEDITERRANEAN CLIMATE**  
 P. Marín-Membrive<sup>1</sup>, M.A. Moreno-Teruel<sup>1</sup>, F.D. Molina-Aiz<sup>1</sup>, D.L. Valera<sup>1</sup>, A. López<sup>1</sup>  
<sup>1</sup>*Universidad de Almería; Centro de Investigación en Biotecnología Agroalimentaria – BITAL, Spain*
- PS1.27 **INFLUENCE OF GREENHOUSE'S SHAPE IN THE STRUCTURAL PERFORMANCE AND THERMAL COMFORT**  
J.G. Vieira Neto<sup>1</sup>, J. Soriano<sup>1</sup>  
<sup>1</sup>*University of Campinas, Brasil*
- PS1.28 **LIQUID DESICCANT DEHUMIDIFICATION SYSTEM FOR IMPROVING GREENHOUSE MICROCLIMATE AND ENERGY USE EFFICIENCY IN YEAR-ROUND GREENHOUSE VEGETABLE PRODUCTION**  
 X. Hao<sup>1</sup>, X. Guo<sup>2</sup>, J. Zheng<sup>2</sup>, C. Little<sup>2</sup>, S. Khosla<sup>3</sup>  
<sup>1</sup>*Greenhouse and Processing Crops Research Centre, Agriculture and Agri-Food Canada, Ontario, Canada*, <sup>2</sup>*Greenhouse and Processing Crops Research Centre, Agriculture and Agri-Food Canada, Canada*, <sup>3</sup>*Ontario Ministry of Agriculture Food and Ministry of Rural Affairs, Greenhouse and Processing Crops Research Centre, Ontario, Canada*
- PS1.29 **OPERATION RELIABILITY OF WIRELESS SENSOR NETWORKS IN GREENHOUSE CONDITIONS**  
 N. Katsoulas<sup>1</sup>, A. Tzounis<sup>1</sup>, K.P. Ferentinos<sup>2</sup>, T. Bartzanas<sup>2</sup>, C. Kittas<sup>1</sup>  
<sup>1</sup>*University of Thessaly, Dept. of Agriculture Crop Production and Rural Environment, Greece*, <sup>2</sup>*Centre for Research and Technology - Hellas, Institute for Research and Technology of Thessaly, Greece*
- PS1.30 **BENEFITS OF A SEMI-CLOSED GREENHOUSE FOR TOMATO PRODUCTION IN THE WEST OF FRANCE**  
 S. Le Quillec<sup>1</sup>, B. Albert<sup>1</sup>, D. Lesourd<sup>1</sup>, D. Loda<sup>1</sup>, R. Barette<sup>1</sup>, E. Brajeul<sup>1</sup>  
<sup>1</sup>*CTIFL, France*
- PS1.31 **SPECTRAL DISTRIBUTION OF LIGHT UNDER DIFFERENT STRUCTURES AND COVER MATERIALS EMPLOYED IN MEDITERRANEAN GREENHOUSES**  
 M. Pérez<sup>1</sup>, J. Barbero<sup>1</sup>, M.T. Lao<sup>1</sup>  
<sup>1</sup>*University of Almeria, Spain*

- PS1.32 **EVALUATION OF PLASTIC NETS PERMEABILITY INTO MICRO WIND TUNNEL**  
S. Castellano<sup>1</sup>, G. Starace<sup>2</sup>, M. Lippolis<sup>3</sup>, L. De Pascalis<sup>2</sup>, G.S. Mugnozza<sup>4</sup>  
<sup>1</sup>University of Foggia, Italy, <sup>2</sup>University of Salento, Italy, <sup>3</sup>Sachim SRL, Italy, <sup>4</sup>University of Bari, Italy
- PS1.33 **INFLUENCE OF COLOUR NET SHADING ON QUANTITY AND QUALITY OF SWEET PEPPER YIELD IN HUNGARY**  
H.D. Ledó<sup>1</sup>  
<sup>1</sup>DélKerTész, Hungary
- PS1.34 **TECHNICAL AND AGRONOMIC BEHAVIOR OF PLASTIC NETS FOR THE GREENHOUSE CULTIVATION OF SWEET PEPPER IN THE MEDITERRANEAN AREA**  
D. Castronuovo<sup>1</sup>, D. Statuto<sup>1</sup>, N. Muro<sup>1</sup>, P. Picuno<sup>1</sup>, V. Candido<sup>1</sup>  
<sup>1</sup>University of Basilicata – SAFE, Italy
- PS1.35 **CHANGES OF SOME PHYSICAL PROPERTIES OF DIFFERENT LOW-DENSITY POLYETHYLENE FILMS DURING THE USEFUL LIFE**  
N.Y. Emekli<sup>1</sup>, K. Buyuktas<sup>1</sup>, A. Bascetincelik<sup>2</sup>  
<sup>1</sup>Akdeniz University Faculty of Agriculture, Turkey, <sup>2</sup>Cukurova University Faculty of Agriculture, Turkey
- PS1.36 **EFFECT OF RED PHOTOSELECTIVE SCREEN IN THE DEVELOPMENT AND YIELD OF FRESH TOMATO**  
T. Mendanha<sup>1</sup>, R.C. Ferreira<sup>1</sup>, A. Seleguini<sup>1</sup>  
<sup>1</sup>Federal University of Goiás, Brasil
- PS1.37 **PHYSIC-CHEMICAL AND NUTRITIONAL QUALITY PARAMETERS OF TOMATO FRUITS GROWN UNDER RED SHADING SCREENHOUSE**  
T. Mendanha<sup>1</sup>, T.A.P.C. Ferreira<sup>1</sup>, M.R. Fernandes<sup>1</sup>, V.A. Pereira<sup>1</sup>, A. Seleguini<sup>1</sup>, R.C. Ferreira<sup>1</sup>  
<sup>1</sup>Federal University of Goiás, Brasil
- PS1.38 **THE CORRELATION BETWEEN ACCUMULATED TOTAL RADIATION TO YIELD AND QUALITY OF PEPPER**  
L. Avraham<sup>1</sup>, E. Ityel<sup>1</sup>, H. Alon<sup>2</sup>, S. Cohen<sup>2</sup>, S. Gantz<sup>1</sup>, S. Ilani<sup>2</sup>  
<sup>1</sup>Extension Service, Ministry of Agriculture, Bet Dagan, Israel, <sup>2</sup>Besor experimental station, Israel
- PS1.39 **COVER CROPS SHORT TERM EFFECT ON SOIL ARTHROPODS DIVERSITY UNDER ORGANIC GREENHOUSE PRODUCTION**  
S. Madzaric<sup>1</sup>, C.G. Francesco<sup>2</sup>, D. Laura<sup>3</sup>, A.B. Lina<sup>2</sup>, M. Giancarlo<sup>2</sup>, T. Fabio<sup>4</sup>, B. Giovanni<sup>3</sup>  
<sup>1</sup>Università degli Studi di Napoli "Parthenope", Italy, <sup>2</sup>Mediterranean Agronomic Institute of Bari - CIHEAM-MAIB, Italy, <sup>3</sup>Università di Bologna, Italy, <sup>4</sup>Consiglio per la Ricerca e la Sperimentazione in Agricoltura-CRA, Italy
- PS1.40 **EFFECT OF SCREENHOUSE COVER OPTICAL PROPERTIES ON SWEET PEPPER FRUIT QUALITY**  
N. Katsoulas<sup>1</sup>, O. Kaltsa<sup>2</sup>, N. Rigakis<sup>1</sup>, E. Kitta<sup>2</sup>  
<sup>1</sup>University of Thessaly, Greece, <sup>2</sup>Centre for Research and Technology Hellas, Greece



PS1.41 **CLIMATE CHARACTERIZATION UNDER PROTECTION FACILITIES OF AMERICAN INTER-TROPICAL REGION**

G.A. Salcedo<sup>1</sup>, M.T. Lao<sup>2</sup>

<sup>1</sup>*University of Guayaquil, Ecuador,* <sup>2</sup>*University of Almería, Spain*

## Scientific Program, July, 21

### Oral presentations

8:30 – 9:15 – Invited speaker	Auditorium
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#### GREENHOUSE TECHNOLOGY FOR CULTIVATION IN ARID AND SEMI-ARID REGIONS

E. J. Baeza<sup>1</sup>, M. Kacira

<sup>1</sup>Centro IFAPA La Mojonera, Spain

9:15 – 11:05 – Oral session O7. Greenhouse management and product quality I	R110
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Chair: C. Stanghellini

#### Keynote lecture:

#### CONTROLLED ENVIRONMENT AGRICULTURE (CEA) IN THE WORLDWIDE FOOD ENERGY WATER NEXUS

G. Giacomelli

*Department of Agricultural and Biosystems Engineering. University of Arizona, USA*

#### OS7.1 PRICE FORECAST OF GREEN LEAFY VEGETABLES USED IN GREENHOUSE RESOURCE PLANNING SYSTEM

D. Guo<sup>1</sup>, X. Zhai<sup>2</sup>, D. Huang<sup>1</sup>

<sup>1</sup>Shanghai Jiao Tong University, China <sup>2</sup>Shanghai Municipal Agricultural Commission, China

#### OS7.2 PERFECT ROSES AND ENERGY EFFICIENT CULTIVATION

A. de Gelder<sup>1</sup>

<sup>1</sup>Wageningen UR Greenhouse Horticulture, The Netherlands

#### OS7.3 OSCILLATORY ANALYSIS OF CIRCADIAN GENE EXPRESSION BY TIME-SERIES RNA-SEQ ASSAY

T. Higashi<sup>1</sup>, H. Fukuda<sup>2</sup>

<sup>1</sup>Graduate School of Life and Environmental Sciences, Osaka Prefecture University, Japan,

<sup>2</sup>Graduate School of Engineering, Osaka Prefecture University, Japan

#### OS7.4 PLANT GROWTH ANALYSIS

M. Dinar<sup>1</sup>

<sup>1</sup>Paskal Technologies

9:15 – 11:05 – Oral session O8. Computational Fluid Dynamics I	R115
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Chair: I.B. Lee

#### Keynote lecture:

#### ADVANCES AND CHALLENGES IN CFD APPLICATIONS FOR OPTIMIZING CEA SYSTEMS

M. Kacira

*Department of Agricultural and Biosystems Engineering. University of Arizona, USA*

#### OS8.1 A COMPUTATIONAL FLUID DYNAMICS INVESTIGATION OF FLOW, SOLAR RADIATION, HEAT TRANSFER, TRANSPIRATION AND CONDENSATION IN A GREENHOUSE

P. Farber<sup>1</sup>, K. Farber<sup>1</sup>, J. Gräbel<sup>1</sup>, S. Krick<sup>1</sup>, P. Ueberholz<sup>1</sup>

<sup>1</sup>IMH - Institute of Modelling and High-Performance Computing, Germany

#### OS8.2 INCREASING THE HEIGHT AND MULTIPLYING THE NUMBER OF SPANS OF GREENHOUSES: HOW FAR CAN WE GO?

H. Fatnassi<sup>1</sup>, T. Boulard<sup>1</sup>, H. Benamara<sup>2</sup>, J.C. Roy<sup>3</sup>, R. Suay<sup>1</sup>, R. Brun<sup>1</sup>, C. Poncet<sup>1</sup>

<sup>1</sup>INRA- UMR ISA 1355 TEAPEA, France, <sup>2</sup>Centre de recherche et des technologies de l'énergie

**OS8.3 NUMERICAL ANALYSIS OF THE NATURAL VENTILATION IN A PLASTIC GREENHOUSE WITH RIDGE AND SIDE VENTILATION PROTECTED BY A NET WINDBREAK**

A. Mistriotis<sup>1</sup>, A. Giannoulis<sup>1</sup>, D. Briassoulis<sup>1</sup>

<sup>1</sup>Agricultural University of Athens, Greece

**OS8.4 CFD PREDICTION OF THE DAYTIME CLIMATE EVOLUTION INSIDE A GREENHOUSE, TAKING ACCOUNT OF THE CROP INTERACTION, SUN PATH AND GROUND CONDUCTION.**

P.E. Bournet<sup>1</sup>, B. Morille<sup>1</sup>, C. Migeon<sup>1</sup>

<sup>1</sup>Agrocampus Ouest, UP EPHor Environmental Physics and Horticulture Research Unit, Angers, France

9:15 – 11:05 – Oral session O9. Energy I

R131

Chair: H. Tantau

**Keynote lecture:**

**IMPROVING THE PERFORMANCE OF SOLAR ENERGY ACQUISITION IN GREENHOUSES** Q. Yang

*Institute of Environment and Sustainable Development in Agriculture, Chinese Academy of Agricultural Sciences (CAAS), China*

**OS9.1 MULTIFACETED COMPARISON BETWEEN AN OIL FAN HEATER AND AN AIR-SOURCE HEAT PUMP USED IN GREENHOUSES**

F. Goto<sup>1</sup>, K. Shoji<sup>1</sup>

<sup>1</sup>Central Research Institute of Electric Power Industry, Japan

**OS9.2 GREENHOUSE CONCEPT WITH HIGH INSULATING COVER BY COMBINATION OF GLASS AND FILM: DESIGN AND FIRST EXPERIMENTAL RESULTS**

F. Kempkes<sup>1</sup>, J. Janse<sup>1</sup>, S. Hemming<sup>1</sup>

<sup>1</sup>Wageningen UR greenhouse horticulture, The Netherlands

**OS9.3 AN OPTIMAL THERMODYNAMIC GREENHOUSE: THE EXE-KAS**

F. Bronchart<sup>1</sup>, M. De Paepe<sup>2</sup>, P. Demeyer<sup>1</sup>

<sup>1</sup>Institute for Agricultural and Fisheries Research, Belgium <sup>2</sup>Ghent University, Flow Heat and Combustion Mechanics, Belgium

11:30 – 13:10 – Oral session O10. Greenhouse management and product quality II

R110

Chair: U. Schmidt

**OS10.1 QUANTIFYING THE SOURCE-SINK BALANCE IN THREE TOMATO CULTIVARS**

T. Li<sup>1</sup>, E. Heuvelink<sup>1</sup>, L. Marcelis<sup>1</sup>

<sup>1</sup>Horticulture and Product Physiology Group, Wageningen UR, The Netherlands

**OS10.2 LINKING PLANT WATER STATUS TO TOMATO FRUIT PRODUCTION AND QUALITY DURING DROUGHT AND SALT STRESS**

B.A.E. Van de Wal<sup>1</sup>, V. De Schepper<sup>1</sup>, J. Hanssens<sup>1</sup>, K. Steppe<sup>1</sup>

<sup>1</sup>Laboratory of Plant Ecology, Faculty of Bioscience Engineering, Ghent University, Belgium

**OS10.3 MINIMUM TRANSPIRATION IN RELATION TO ENERGY EFFICIENT CULTIVATION**

A. de Gelder<sup>1</sup>

<sup>1</sup>Wageningen UR Greenhouse Horticulture, The Netherlands

OS10.4 **CROP GROWTH MODELING: A POTENTIAL METHOD FOR SITE-SPECIFIC MANAGEMENT OF GREENHOUSES**

M.B. Lak<sup>1</sup>, S. Minaei<sup>1</sup>

<sup>1</sup>*Biosystems Engineering Department, Tarbiat Modares University, Tehran, Iran*

11:30 – 13:10 – Oral session O11. Computational Fluid Dynamics II

R115

Chair: R. Suay

OS11.1 **ESTIMATION OF WIND PRESSURE COEFFICIENTS BUILT IN RECLAIMED LAND**

R.W. Kim<sup>1</sup>, I.B. Lee<sup>1</sup>

<sup>1</sup>*Seoul National University, Korea*

OS11.2 **IMPROVEMENT OF AERODYNAMICS IN AN INDOOR PLANT FACTORY**

Y. Zhang<sup>1</sup>, M. Kacira<sup>1</sup>

<sup>1</sup>*University of Arizona, USA*

OS11.3 **ANALYSIS OF INTERNAL VENTILATION EFFICIENCY OF NATURAL VENTILATED GREENHOUSE BUILT IN RECLAIMED LAND ACCORDING TO VARIOUS GREENHOUSE TYPES USING CFD**

S.Y. Lee<sup>1</sup>, I.B. Lee<sup>1</sup>, J.S. Ha<sup>1</sup>

<sup>1</sup>*Seoul National University, Korea*

OS11.4 **NUMERICAL ANALYSIS AND EXPERIMENTAL VALIDATION OF THE DISTRIBUTED CLIMATE IN A GREENHOUSE WITH SCREENS FOR DIFFERENT VENTILATION OPENINGS ARRANGEMENTS**

T. Bartzanas<sup>1</sup>, N. Katsoulas<sup>2</sup>, C. Kittas<sup>2</sup>

<sup>1</sup>*Centre for Research and Technology-HELLAS, Greece*, <sup>2</sup>*University of Thessaly, Greece*

OS11.5 **ANALYSIS OF THE AIRFLOW PATTERN AND TEMPERATURE DISTRIBUTION IN A FAN HEATING SYSTEM OF A 'PARRAL-TYPE' GREENHOUSE USING CFD SIMULATIONS**

P. Fernández del Olmo<sup>1</sup>, J.A. Sánchez-Molina<sup>1</sup>, M. Berenguel Soria<sup>1</sup>, J.C. López<sup>2</sup>, J.L. Guzmán Sánchez<sup>1</sup>, F. Rodríguez Díaz<sup>1</sup>

<sup>1</sup>*Univerty of Almería, Spain*, <sup>2</sup>*Cajamar Foundation, Spain*

11:30 – 13:10 – Oral session O12. Energy II

R131

Chair: N. Katsoulas

OS12.1 **ENERGY SAVING TECHNOLOGIES AND STRUCTURE INNOVATION OF CHINESE SOLAR GREENHOUSE**

Q. Yang<sup>1</sup>, Y. Zhang<sup>1</sup>, H. Fang<sup>1</sup>, S. Zhou<sup>1</sup>, W. Lu<sup>1</sup>

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

OS12.2 **CONTRIBUTION OF PHOTOVOLTAICS TO PERFORMANCE IMPOVEMENT OF GREENHOUSES**

Y. Tripanagnostopoulos<sup>1</sup>, A. Kavga<sup>2</sup>, P. Zafeirakis<sup>3</sup>, G. Trypanagnostopoulos<sup>3</sup>, E. Karantagli<sup>3</sup>

<sup>1</sup>*University of Patras, Patras, Greece*, <sup>2</sup>*TEI Patras, Greece*, <sup>3</sup>*University of Patras, Greece*

OS12.3 **FINAL RESULTS FROM ZINEG SUBPROJECT SOLAR COLLECTOR GREENHOUSE: ENERGY AND WATER SAVINGS, YIELD, QUALITY AND ECONOMIC FEASIBILITY**

U. Schmidt<sup>1</sup>, D. Dannehl<sup>2</sup>, T. Rockschi<sup>1</sup>, I. Schuch<sup>2</sup>, L. Miranda<sup>1</sup>, R. Salazar Moreno<sup>3</sup>, A. Rojano Aguilar<sup>3</sup>, I. Lopez Cruz<sup>3</sup>

<sup>1</sup>Humboldt-Universität zu Berlin, Germany, <sup>2</sup>Humboldt-Universität zu Berlin, Germany,  
<sup>3</sup>Autonomous University of Chapingo, Mexico

**OS12.4 PERFORMANCE OF INTRODUCING OUTDOOR COLD AIR FOR COOLING A PLANT FACTORY WITH ARTIFICIAL LIGHT**

M. Xin<sup>1</sup>, Y. Tong<sup>1</sup>, Q. Yang<sup>1</sup>, J. Wang<sup>1</sup>

<sup>1</sup>Institute of Environment and Sustainable Development in Agriculture, Chinese Academy of Agricultural Sciences, Key Lab of Energy Conservation & Waste Management of Agricultural Structures, Ministry of Agriculture, Beijing, China

15:00 – 16:40 – Oral session O13. Crop Modelling

R110

Chair: W. Luo

**OS13.1 LEAF INITIATION RATE IS DETERMINED BY MORE THAN JUST AIR TEMPERATURE: CONSIDERATIONS FOR GREENHOUSE CLIMATE CONTROL AND CROP MODELING**

A. Savvides<sup>1</sup>, W. Van Ieperen<sup>2</sup>, J.A. Dieleman<sup>3</sup>, L.F.M. Marcelis<sup>2</sup>

<sup>1</sup>Wageningen University - Horticulture & Product Physiology; Wageningen UR Greenhouse Horticulture, The Netherlands, <sup>2</sup>Wageningen University - Horticulture & Product Physiology, The Netherlands, <sup>3</sup>Wageningen UR Greenhouse Horticulture, The Netherlands

**OS13.2 ANALYSING UNDERLYING PROCESSES FOR YIELD DIFFERENCES BETWEEN TOMATO CULTIVARS**

E. Heuvelink<sup>1</sup>, P. Kasemsap<sup>1</sup>, Y. Zhang<sup>1</sup>, F. Millenaar<sup>2</sup>

<sup>1</sup>Horticulture and Product Physiology group, Wageningen University, The Netherlands, <sup>2</sup>Bayer Crop Science

**OS13.3 DATA ASSIMILATION TO IMPROVE STATES AND PARAMETERS ESTIMATION FOR A DYNAMIC GROWTH MODEL FOR GREENHOUSE TOMATOES**

J.C. Torres Monsiváis<sup>1</sup>, A. Ruiz García<sup>1</sup>, I.L. López Cruz<sup>1</sup>, A. Ramírez Arias<sup>1</sup>, R.D. Peña Moreno<sup>2</sup>

<sup>1</sup>University of Chapingo, Mexico, <sup>2</sup>Autonomous University of Puebla, Mexico

**OS13.4 PREDICTING PEPPER FRUIT YIELD BASED ON TEMPERATURE AND SOLAR RADIATION**

E. Ityel<sup>1</sup>, L. Avraham<sup>1</sup>

<sup>1</sup>Extension Service, Ministry of Agriculture, Bet Dagan, Israel

**OS13.5 STOMATAL RESISTANCE MODELLING USING THE FULL FACTORIAL DESIGN: APPLICATION TO THE NEW GUINEA IMPATIENS**

H. Bouhoun Ali<sup>1</sup>, P. Bournet<sup>1</sup>, P. Cannavo<sup>1</sup>, C. Migeon<sup>1</sup>, E. Chantoiseau<sup>1</sup>, M. Sourgnès<sup>1</sup>

<sup>1</sup>Agrocampus Ouest, UP EPHor Environmental Physics and Horticulture Research Unit, France

15:00 – 16:40 – Oral session O14. Computational Fluid Dynamics III

R115

Chair: T. Bartzanas

**OS14.1 NUMERICAL SIMULATION OF THE EFFECT OF DIFFERENT MULCHES ON THE HEAT STORAGE CAPACITY OF A MEDITERRANEAN GREENHOUSE SOIL**

E.J. Baeza<sup>1</sup>, A. Sapounas<sup>2</sup>, C. Stanghellini<sup>2</sup>, S. Bonachela<sup>3</sup>, J. Hernández<sup>3</sup>, J.I. Montero<sup>4</sup>, J.C. López<sup>5</sup>, M.R. Granados<sup>3</sup>, P. Muñoz<sup>4</sup>, P. Lorenzo<sup>1</sup>, P. Fernández del Olmo<sup>3</sup>

<sup>1</sup>IFAPA La Mojonera, Spain, <sup>2</sup>Wageningen UR Greenhouse Horticulture, The Netherlands, <sup>3</sup>University of Almería, Spain, <sup>4</sup>IRTA, Spain, <sup>5</sup>Research Station Cajamar "Las Palmerillas", Spain

OS14.2 **FLOW CHARACTERISTIC IN RACEWAY POND FOR MICROALGAE CULTIVATION**

I.H. Seo<sup>1</sup>, J.Y. Choi<sup>1</sup>, Y.J. Bae<sup>1</sup>

<sup>1</sup>Research Institute of Green Eco Engineering, Seoul National University, Korea

OS14.3 **CFD ANALYSIS OF THE CLIMATE INSIDE A CLOSED GREENHOUSE AT NIGHT INCLUDING CONDENSATION AND CROP TRANSPIRATION**

H. Bouhoun Ali<sup>1</sup>, P.E. Bournet<sup>1</sup>, V. Danjou<sup>1</sup>, C. Migeon<sup>1</sup>

<sup>1</sup>Agrocampus Ouest, UP EPHor Environmental Physics and Horticulture Research Unit, Angers, France

OS14.4 **DESIGN OF HEATING SYSTEM USING BRANCHING DUCT FOR UNIFORM TEMPERATURE DISTRIBUTION IN CUCUMBER GREENHOUSE**

R. Ibuki<sup>1</sup>, M. Ishii<sup>2</sup>, H. Sakai<sup>3</sup>

<sup>1</sup>Miyagi university, Japan <sup>2</sup>National Agriculture and Food Research Organization, Japan.

<sup>3</sup>Miyagi Prefectural Agriculture and Horticulture Research Centre, Japan

15:00 – 16:40 – Oral session O15. Energy III

R131

Chair: M. Teitel

OS15.1 **INNOVATED ENERGY EFFICIENT GREENHOUSE HEATING AND COOLING SYSTEM**

B.A. Krug<sup>1</sup>, B. Luce<sup>2</sup>

<sup>1</sup>University of New Hampshire, USA <sup>2</sup>Lyndon State College, USA

OS15.2 **SOLID BIOMASS AS SUSTAINABLE ENERGY OPTION FOR GREENHOUSE HEATING IN ITALY**

C.A. Campiotti<sup>1</sup>, C. Bibbiani<sup>2</sup>, A. Latini<sup>1</sup>, E. Schettini<sup>3</sup>, M. Scoccianti<sup>1</sup>, C. Viola<sup>1</sup>, G. Vox<sup>3</sup>

<sup>1</sup>ENEA - Italian National Agency for New Technologies, Energy and Sustainable Economic Development, Rome, Italy, <sup>2</sup>Dipartimento di Scienze Veterinarie, University of Pisa, Italy,

<sup>3</sup>Department of Agricultural and Environmental Science DISAAT – University of Bari Bari, Italy

OS15.3 **DETERMINING THE GREENHOUSE HEAT ENERGY REQUIREMENT WITH DIFFERENT TECHNICAL MEASURES UNDER MERSIN (TURKEY) CLIMATE CONDITIONS**

B. Kaya<sup>1</sup>, N. Baytorun<sup>2</sup>

<sup>1</sup>Eastern Mediterranean Agricultural Research Enstitute, Adana/TURKEY , <sup>2</sup>Faculty of Agriculture, Department of Farm Structures and Irrigation, Cukurova University, Adana/TURKEY

**Poster presentations**

17:00 – 18:00 – Poster session II

R129

**Greenhouse management and product quality**

PS2.1 **PLANTING DENSITY, PHYLLOCHRON AND STRAWBERRY PRODUCTION GROWN IN SUBSTRATE**

E.O. Calvete<sup>1</sup>, R.C. Costa<sup>1</sup>, H.F.C. Mendonça<sup>1</sup>, A.P. Cecatto<sup>1</sup>, L.A. DeCosta<sup>1</sup>, F.S. De Nardi<sup>1</sup>, A.C. Pedersen<sup>1</sup>

<sup>1</sup>University of Passo Fundo, Brazil

PS2.2 **CORRELATION BETWEEN THE NUTRIENTS REMOVAL AND THE STRAWBERRY PRODUCTION IN DIFFERENT GROWTH SYSTEMS**

E.O. Calvete<sup>1</sup>, R.C. Costa<sup>1</sup>, R. Nitsche<sup>1</sup>, J.T. Loss<sup>1</sup>, A. Rambo<sup>1</sup>

<sup>1</sup>University of Passo Fundo, Brazil

- PS2.3 **INFLUENCE OF TEMPERATURE AND SALINITY ON TOMATO QUALITY OF A HIGH VALUE COMMERCIAL CULTIVAR**  
M.J. Sánchez-González<sup>1</sup>, M.C. Sánchez-Guerrero<sup>1</sup>, E. Medrano<sup>1</sup>, M.E. Porras<sup>1</sup>, E.J. Baeza<sup>1</sup>, P. Lorenzo<sup>1</sup>  
<sup>1</sup>IFAPA, La Mojonera, Spain
- PS2.4 **WATER-USE EFFICIENCY OF CUCUMBER SEEDLINGS ACCLIMATED TO DIFFERENT VAPOR-PRESSURE DEFICITS**  
K. Kanou<sup>1</sup>, T. Shibuya<sup>1</sup>, R. Endo<sup>1</sup>, Y. Kitaya<sup>1</sup>  
<sup>1</sup>Osaka Prefecture University, Japan
- PS2.5 **VARIABILITY FOR PHYSICAL-CHEMICAL AND NUTRITIONAL CHARACTERISTICS OF THREE BLACKBERRIES CULTIVARS GROWN IN GREENHOUSE**  
M.C. García García<sup>1</sup>, F. Pascual<sup>1</sup>, R. Font<sup>1</sup>, P. Gómez<sup>1</sup>, M.R. Celestino<sup>1</sup>  
<sup>1</sup>IFAPA, La Mojonera, Spain
- PS2.6 **HOW IRRIGATION AFFECTS THE MICROCLIMATE OF A PLASTIC MEDITERRANEAN GREENHOUSE WITHOUT CROP**  
M.R. Granados<sup>1</sup>, S. Bonachela<sup>1</sup>, J.C. López<sup>2</sup>, J.J. Magán<sup>2</sup>, J. Hernández<sup>1</sup>  
<sup>1</sup>University of Almeria, Spain, <sup>2</sup>Estación Experimental de la Fundación Cajamar, Spain
- PS2.7 **AN ALTERNATIVE TO CONVENTIONAL FOSSIL FUEL HEATING SYSTEMS: WATER FILLED PASSIVE NIR ABSORBING POLYETHYLENE SLEEVES**  
E.J. Baeza<sup>1</sup>, E. Medrano<sup>1</sup>, M.C. Sánchez Guerrero<sup>1</sup>, M.J. Sánchez-González<sup>1</sup>, M.E. Porras<sup>1</sup>, M.Giménez<sup>1</sup>, P. Lorenzo<sup>1</sup>  
<sup>1</sup>IFAPA La Mojonera, Spain
- PS2.8 **COMPARATIVE STUDY OF TOMATO PRODUCTION STRATEGIES IN MEDITERRANEAN AREA:LONG-DURATION CROP IN SANDED SOIL, INTERPLANTING SYSTEM IN DIFFERENT SUBSTRATES**  
J.C. Gázquez<sup>1</sup>, C. Pérez<sup>1</sup>, D.E. Meca<sup>1</sup>, M.D. Segura<sup>1</sup>, M.A. Domene<sup>1</sup>, E. De la Cruz<sup>2</sup>, J.C. López<sup>1</sup>  
<sup>1</sup>Estación Experimental de Cajamar Las Palmerillas, Fundación Cajamar – Grupo Cooperativo Cajamar, Spain, <sup>2</sup>Negocio Agroalimentario y Cooperativo, CAJAMAR CAJA RURAL, Spain
- PS2.9 **EVALUATION OF HOOK SYSTEMS AND CROP DENSITIES TO INCREASE TOMATO PRODUCTION IN THE MEDITERRANEAN AREA**  
J.C. Gázquez<sup>1</sup>, C. Pérez<sup>1</sup>, D.E. Meca<sup>1</sup>, M.D. Segura<sup>1</sup>, M.A. Domene<sup>1</sup>, J.C. López<sup>1</sup>  
<sup>1</sup>Estación Experimental de Cajamar Las Palmerillas, Fundación Cajamar – Grupo Cooperativo Cajamar, Spain
- PS2.10 **COMPARATIVE PERFORMANCE OF SELECTED ORNAMENTALS UNDER LED-LIGHTING**  
L. Zheng<sup>1</sup>, M.C. Van Labeke<sup>1</sup>  
<sup>1</sup>Department of Plant Production, Faculty of Bioscience Engineering, Ghent University, Belgium
- PS2.11 **ACCELERATING TOMATOES RIPENING AT THE END OF THE CULTURE WITH ETHYLENE INJECTION IN GREENHOUSE**  
C. Gilli<sup>1</sup>, Y. Fleury<sup>1</sup>, C. Camps<sup>1</sup>  
<sup>1</sup>Agroscope, France

- PS2.12 **SWEET PEPPER ACCLIMATION TO VARIABLE CO<sub>2</sub> SUPPLY IN A MEDITERRANEAN GREENHOUSE**  
M.E. Porras<sup>1</sup>, E. Medrano<sup>1</sup>, P. Lorenzo<sup>1</sup>, M.J. Sánchez-González<sup>1</sup>, E. J. Baeza<sup>1</sup>, M.C. Sánchez-Guerrero<sup>1</sup>  
<sup>1</sup>IFAPA La Mojonera, Spain
- PS2.13 **SWEET PEPPER GROWN UNDER SALINITY STRESS AS AFFECTED BY CO<sub>2</sub> ENRICHMENT AND NITROGEN SOURCE**  
M.E. Porras<sup>1</sup>, E. Medrano<sup>1</sup>, P. Lorenzo<sup>1</sup>, M.J. Sánchez-González<sup>1</sup>, E. J. Baeza<sup>1</sup>, M.C. Piñero<sup>2</sup>, M.C. Sánchez-Guerrero<sup>1</sup>  
<sup>1</sup>IFAPA La Mojonera, Spain, <sup>2</sup>IMIDA, Spain
- PS2.14 **TOMATOES WITH DIFFERENT FRUIT COLOURS ARE POTENTIAL FOR INCREASING QUALITY**  
N. Tomlekova<sup>1</sup>, S. Masheva<sup>1</sup>  
<sup>1</sup>Maritsa Vegetable Crops Research Institute, Plovdiv, Bulgaria
- PS2.15 **COMPARISON OF SOIL AND SOILLESS PRODUCTION OF BASIL (OCIMUM BASILICUM L.) IN MEDITERRANEAN CLIMATIC CONDITIONS**  
Ch. Lykas<sup>1</sup>, G. Basouris<sup>1</sup>, S. Petropoulos<sup>1</sup>, A. Karkanis<sup>1</sup>  
<sup>1</sup>University of Thessaly, Greece
- PS2.16 **INCREASED CONCENTRATIONS OF NUTRITIVE COMPOUNDS AND PHYTONUTRIENTS IN GREENHOUSE TOMATOES EXPOSED TO LED LIGHTING OF DIFFERENT WAVELENGTH SPECTRA**  
S. Pepin<sup>1</sup>, M. Dorais<sup>2</sup>, R. Bacon<sup>2</sup>, C. Ménard<sup>2</sup>, J. Méthot<sup>1</sup>, M. Thériault<sup>2</sup>  
<sup>1</sup>University Laval, Canada, <sup>2</sup>Agriculture and Agri-Food Canada, Univ. Laval, Canada
- PS2.17 **GROWTH AND DEVELOPMENT OF MELON AS AFFECTED BY PLANT DENSITY IN GREENHOUSE CULTIVATION**  
A. Ramírez-Arias<sup>1</sup>, J. Pineda-Pineda<sup>2</sup>, E. Fitzz-Rodriguez<sup>3</sup>, R. Ortiz Alcantara<sup>3</sup>  
<sup>1</sup>University of Chapingo, Mexico, <sup>2</sup>Universidad Autónoma Chapingo, Mexico, <sup>3</sup>Universidad Autónoma Chapingo, Mexico
- PS2.18 **CHOICE OF OPTIMUM NUTRIENT SOLUTION AND VARIATION OF ANTIOXIDANT CONTENT OF AGASTACHE RUGOSA UNDER A HYDROPONIC CULTURE SYSTEM**  
S.J. Kim<sup>1</sup>, H.J. Kim<sup>1</sup>, J.M. Choi<sup>1</sup>, J.S. Park<sup>1</sup>  
<sup>1</sup>Department of Horticultural Science, Chungnam National University, Daejeon, Korea
- PS2.19 **EFFECT OF SALINITY STRESS ON THE VASE LIFE OF CUT ROSES GROWN AT HIGH RELATIVE AIR HUMIDITY**  
D.R.A. Carvalho<sup>1</sup>, M.W. Vasconcelos<sup>1</sup>, E. Heuvelink<sup>2</sup>, S.M.P. Carvalho<sup>1,2,3</sup>  
<sup>1</sup>CBQF – Centro de Biotecnologia e Química Fina – Laboratório Associado, Escola Superior de Biotecnologia, Universidade Católica Portuguesa, Porto, Portugal, <sup>2</sup>Plant Sciences Group, Wageningen University and Research center, Horticulture and Product Physiology, Wageningen, The Netherlands, <sup>3</sup>Faculty of Sciences, University of Porto, Porto, Portugal
- PS2.20 **EFFECT OF GRAFTING ON THE PRECOCITY, PRODUCTIVITY AND WATER USE EFFICIENCY OF GREENHOUSE TOMATOES**  
R.J.O.T. Simões<sup>1</sup>, B.S. Rosa<sup>1</sup>, S.M.P. Carvalho<sup>1,2</sup>  
<sup>1</sup>Faculdade de Ciências, Universidade do Porto, Departamento de Geociências Ambiente e Ordenamento do Território, Porto, Portugal, <sup>2</sup>CBQF - Centro de Biotecnologia e Química Fina – Laboratório Associado, Escola Superior de Biotecnologia, Universidade Católica Portuguesa/Porto, Porto, Portugal



**PS2.21 SENSITIVITY ANALYSIS OF AIR TEMPERATURE VARIATIONS USING A CHINESE SOLAR GREENHOUSE MODEL**

G. Tong<sup>1</sup>, D.M. Christopher<sup>2</sup>

<sup>1</sup>*College of Water Conservancy, Shenyang Agricultural University, Shenyang, China,*

<sup>2</sup>*Department of Thermal Engineering, Tsinghua University, Beijing, China*

**PS2.22 SIMULATED PERFORMANCE OF A NATURE VENTILATED CHINESE SOLAR GREENHOUSE USING CFD**

H. Fang<sup>1</sup>, Y. Zhang<sup>1</sup>

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

**PS2.23 NUMERICAL PREDICTION OF THERMAL ENVIRONMENT AND ENERGY CONSUMPTION OF THREE DIFFERENT GREENHOUSES UNDER HOT AND SEMI ARID CLIMATE**

K. Mesmoudi<sup>1</sup>, K. Meguellati<sup>1</sup>, P.E. Bournet<sup>2</sup>, L. Serir<sup>1</sup>

<sup>1</sup>*University of Batna, Algeria,* <sup>2</sup>*EPHOR, Agrocompus Ouest, France*

**PS2.24 PREDICTION OF LEAKAGE RATE OF A GREENHOUSE USING COMPUTATIONAL FLUID DYNAMICS**

T. Kuroyanagi<sup>1</sup>

<sup>1</sup>*Western Region Agricultural Research Center, NARO, Japan*

**PS2.25 EFFECT OF DRAG COEFFICIENT OVER THE NATURAL VENTILATION SYSTEM IN A SCREENHOUSE BY USING CFD**

J. Flores-Velazquez<sup>1</sup>, A. Rojano<sup>2</sup>, F. Villarreal<sup>3</sup>, W. Ojeda<sup>4</sup>

<sup>1</sup>*Mexican Institute of Water Technology, Mexico,* <sup>2</sup>*Chapingo University, Mexico* <sup>3</sup>*Chihuahua University, Mexico,* <sup>4</sup>*IMTA*

**PS2.26 CFD DETERMINATION OF THE CLIMATE DISTRIBUTION IN A SEMI CLOSED GREENHOUSE WITH AIR COOLING**

J.C. Roy<sup>1</sup>, H. Fatnassi<sup>2</sup>, T. Boulard<sup>2</sup>, J.B. Pouillard<sup>2</sup>, A. Grisey<sup>3</sup>

<sup>1</sup>*Institut FEMTO-ST, Université de Franche-Comté, Belfort - France,* <sup>2</sup>*INRA- UMR ISA 1355 TEAPEA, France,* <sup>3</sup>*CTIFL- Centre de Balandran, Bellegarde – France*

**PS2.27 MODELING OF BIOMASS PRODUCTIVITY IN DENSE MICROALGAL CULTURE USING COMPUTATIONAL FLUID DYNAMICS**

P. Fernández-del Olmo<sup>1</sup>, J.M. Fernández-Sevilla<sup>1</sup>, F.G. Acien<sup>1</sup>, A. González-Céspedes<sup>2</sup>, J.J. Magán<sup>2</sup>, J.C. López<sup>2</sup>

<sup>1</sup>*Chemical Engineering Department, University of Almeria, Almería, Spain,* <sup>2</sup>*Estación Experimental de Cajamar Las Palmerillas, Fundación Cajamar – Grupo Cooperativo Cajamar, Almería, Spain*

**PS2.28 EXTERNAL PRESSURE COEFFICIENT OVER TWO SINGLE SPAN GREENHOUSES WITH PARABOLIC ROOFS IN TANDEM ARRANGEMENT**

G. Ntinis<sup>1</sup>, I. Dados<sup>1</sup>, D. Kateris<sup>1</sup>, V. Fragos<sup>1</sup>, T. Kotsopoulos<sup>1</sup>

<sup>1</sup>*Aristotle University of Thessaloniki, Department of Hydraulics, Soil Sciences and Agricultural Engineering, Greece*

**PS2.29 EFFECT OF VENTILATION OPENINGS IN PRESSURE COEFFICIENT ON SINGLE DUO PITCHED ROOF GREENHOUSES**

V. Fragos<sup>1</sup>, D. Kateris<sup>1</sup>, G. Ntinis<sup>1</sup>, V. Firiris<sup>1</sup>, T. Kotsopoulos<sup>1</sup>

## Crop Modelling

**PS2.30 THE EFFECT OF THE SENSOR PERFORMANCE ON THE UNCERTAINTY ANALYSIS OF EVAPOTRANSPIRATION MODEL**

C. Chen<sup>1</sup>

<sup>1</sup>National Chung Hsing University, Taiwan

**PS2.31 ABILITY OF MULTIPLICATIVE MODELS TO SIMULATE STOMATAL RESISTANCE ALONG PLANT GROWTH: APPLICATION TO THE NEW GUINEA IMPATIENS GROWN IN GREENHOUSE**

M. Sourgnès<sup>1</sup>, C. Migeon<sup>1</sup>, H. Bouhoun Ali<sup>1</sup>, P.E. Bournet<sup>1</sup>, P. Cannavo<sup>1</sup>, E. Chantoiseau<sup>1</sup>

<sup>1</sup>Agrocampus Ouest, UP EPHor Environmental Physics and Horticulture Research Unit, France

**PS2.32 THE DETECTING AND MODELING OF EUSTOMA LEAVES AREA BY MACHINE VISION**

L.H. Chen<sup>1</sup>, J.Y. Chen<sup>2</sup>, C. Chen<sup>3</sup>, C.Y. Chang<sup>1</sup>

<sup>1</sup>Taichung District Agricultural Research and Extension Station, Council of Agriculture, Taiwan,

<sup>2</sup>Dpt. of Bio-industrial Mechatronics Engineering, National ChungHsing University, Taiwan,

<sup>3</sup>National ChungHsing University, Taiwan

**PS2.33 SIMULATION OF TOMATO PRODUCTION UNDER PHOTOVOLTAIC GREENHOUSES**

N. Bertin<sup>1</sup>, H. Fatnassi<sup>2</sup>, G. Vercambre<sup>1</sup>, R. Brun<sup>2</sup>, C. Poncet<sup>2</sup>

<sup>1</sup>INRA-UR 1115 Plantes et Systèmes de culture Horticoles, Avignon, France, <sup>2</sup>INRA- UMR ISA 1355 TEAPEA, Sophia Antipolis Cedex, France

**PS2.34 FULL SIZE TOMATO PLANT PHOTOSYNTHESIS MODEL ESTABLISHED BY REAL TIME MONITORING OF PHOTOSYNTHESIS AND TRANSPIRATION**

K. Shimomoto<sup>1</sup>, K. Takayama<sup>2</sup>, N. Takahashi<sup>2</sup>, H. Nishina<sup>2</sup>

<sup>1</sup>The United Graduate School of Agricultural Sciences, Ehime University, Matsuyama, Japan ,

<sup>2</sup>Faculty of Agriculture, Ehime University, Matsuyama, Japan

**PS2.35 ESTIMATION OF PRECISE TRANSPIRATION AMOUNT OF PAPRIKA BY USING LIGHT DISTRIBUTION IN THE CANOPY**

J.H. Shin<sup>1</sup>, T.I. Ahn<sup>1</sup>, J.W. Lee<sup>1</sup>, J.E. Son<sup>1</sup>

<sup>1</sup>Department of Horticultural Science, Seoul National University, Seoul, Korea

**PS2.36 EVALUATION OF THE SALTMED MODEL FOR TOMATO CROP PRODUCTION IN UNHEATED GREENHOUSES**

L.L. Silva<sup>1</sup>, F.J. Baptista<sup>1</sup>, J.F. Meneses<sup>2</sup>, R. Ragab<sup>3</sup>

<sup>1</sup>Departamento de Engenharia Rural, ECT and ICAAM, Universidade de Évora, Évora, Portugal,

<sup>2</sup>Instituto Superior de Agronomia, Universidade de Lisboa, Lisboa, Portugal, <sup>3</sup>Centre for Ecology and Hydrology (CEH), Wallingford, UK

## Energy

**PS2.37 IMPROVING THE GREENHOUSE ENERGY EFFICIENCY THROUGH THE REUSE OF AGRICULTURAL RESIDUES**

D. Statuto<sup>1</sup>, P. Picuno<sup>1</sup>

<sup>1</sup>University of Basilicata - School of Agricultural, Forestry, Food and Environmental Sciences, Italy

- PS2.38 **DEVELOPMENT OF A SEMI-TRANSPARENT PHOTOVOLTAIC MODULE BASED ON SPHERICAL MICROCELLS FOR GREENHOUSE-ROOF APPLICATIONS**  
A. Yano<sup>1</sup>, Z. Li<sup>1</sup>, M. Onoe<sup>1</sup>, M. Cossu<sup>1</sup>, L. Murgia<sup>2</sup>, H. Nakamura<sup>3</sup>, T. Matsumoto<sup>3</sup>, J. Nakata<sup>4</sup>  
<sup>1</sup>Shimane University, Faculty of Life and Environmental Science, Matsue, Shimane, Japan,  
<sup>2</sup>University of Sassari, Department of Agriculture, Division of Agricultural Engineering, Sassari, Sardinia, Italy, <sup>3</sup>Sphelar Power Corporation, Nakagyo, Kyoto, Japan, <sup>4</sup>Kyosemi Corporation, Fushimi, Kyoto, Japan
- PS2.39 **EFFECTS OF THE PHOTOVOLTAIC ROOFS ON THE GREENHOUSE MICROCLIMATE**  
M. Cossu<sup>1</sup>, A. Yano<sup>1</sup>, L. Murgia<sup>2</sup>, L. Ledda<sup>3</sup>, P.A. Deligios<sup>3</sup>, A. Sirigu<sup>4</sup>, F. Chessa<sup>4</sup>, A. Pazzona<sup>2</sup>  
<sup>1</sup>Shimane University, Faculty of Life and Environmental Science, Japan, <sup>2</sup>University of Sassari, Department of Agriculture, Division of Agricultural Engineering, Sardinia, Italy, <sup>3</sup>University of Sassari, Department of Agriculture, Division of Agronomy and Plant genetics, Sardinia, Italy, <sup>4</sup>Agris Sardegna, Department of Plant Science; Italy
- PS2.40 **USE PRECISE ILLUMINATING FOR ELECTRICITY SAVINGS IN A PLANT FACTORY GROWING LETTUCE**  
L. Kun<sup>1</sup>  
<sup>1</sup>Institute of Environment and Sustainable Development in Agriculture, China
- PS2.41 **APPLICATION OF HEATING SYSTEM WITH ACTIVE HEAT STORAGE-RELEASE AND HEAT PUMP IN LONG SPAN GREENHOUSE**  
Z. Zheng<sup>1,2</sup>, Y. Qichang<sup>1,2</sup>, Z. Yi<sup>1,2</sup>, F. Hui<sup>1,2</sup>  
<sup>1</sup>Institute of Environment and Sustainable in Agriculture, Chinese Academy of Agricultural Science, Beijing, China, <sup>2</sup>Key Laboratory for Energy Saving and Waste Disposal of Protected Agriculture, Ministry of Agriculture, Beijing, China
- PS2.42 **FEASIBILITY STUDY OF AN ELECTRICITY DELIVERING FRESNEL GREENHOUSE**  
P. Sonneveld<sup>1</sup>  
<sup>1</sup>HAN University of Applied Sciences, The Netherlands
- PS2.43 **DESIGN OF A SOLAR COOLING SYSTEM FOR GREENHOUSE CONDITIONING IN A MEDITERRANEAN AREA**  
I. Blanco<sup>1</sup>, G.S. Mugnozza<sup>1</sup>, E. Schettini<sup>1</sup>, G. Puglisi<sup>2</sup>, C.A. Campiotti<sup>2</sup>, G. Vox<sup>1</sup>  
<sup>1</sup>Department of Agricultural and Environmental Science – University of Bari, Italy, <sup>2</sup>ENEA - Italian National Agency for New Technologies, Energy and Sustainable Economic Development - Technical Unit Energy Efficiency, Rome, Italy
- PS2.44 **THE ENERGETIC EFFECTS OF USE OF THE ROCK BED HEAT ACCUMULATOR IN HIGH TUNNEL HORTICULTURAL CROP PRODUCTION IN MODERATE CLIMATE CONDITIONS**  
P. Konopacki<sup>1</sup>, R. Hołownicki<sup>1</sup>, S. Kurpaska<sup>2</sup>, H. Latała<sup>2</sup>, W. Treder<sup>1</sup>, J. Nowak<sup>1</sup>  
<sup>1</sup>Research Institute of Horticulture, Skierniewice, Poland, <sup>2</sup>Institute of Agricultural Engineering and Computer Science, University of Agriculture in Krakow, Kraków, Poland
- PS2.45 **INFLUENCE OF „DYNAMIC OUTSIDE TEMPERATURE CORRECTION (DAT)“ ON ENERGY CONSUMPTION, GROWTH AND QUALITY OF EUPHORBIA PULCHERRIMA**  
A. Albers<sup>1</sup>, U. Ruttensperger<sup>1</sup>, R. Koch<sup>1</sup>  
<sup>1</sup>State Horticultural College and Research Institute Heidelberg, Germany
- PS2.46 **BENEFITS OF TEMPERATURE INTEGRATION IN PROTECTED CULTIVATION OF BUTTERHEAD LETTUCE**  
D. An<sup>1</sup>, B. Peter<sup>1</sup>  
<sup>1</sup>Inagro, Belgium

**PS2.47 COMPARISON OF ALTERNATIVE ENERGY SOURCES USED FOR HEATING PUMP SYSTEMS IN GREENHOUSES**

N. Gkavezou<sup>1</sup>, A. Martzopoulou<sup>1</sup>, A. Moutsiou<sup>1</sup>, G.K. Ntinis<sup>1</sup>

<sup>1</sup>*Aristotle University of Thessaloniki, Greece*

**PS2.48 INFLUENCE OF THERMODYNAMIC DEHUMIDIFICATION ON ENERGY CONSUMPTION, YIELD AND QUALITY OF A SOILLESS TOMATO CULTURE**

C. Gilli<sup>1</sup>, Y. Fleury<sup>1</sup>, C. Camps<sup>1</sup>

<sup>1</sup>*Agroscope, France*

**PS2.49 SNOW VAULT BECOMES STORAGE FACILITY OF ROOT STOCKS AND SUPPLIES COOLANT FOR CHICORY PRODUCTION IN SUMMER**

H. Araki<sup>1</sup>, R. Yamakawa<sup>2</sup>, T. Kumano<sup>3</sup>, T. Yokota<sup>4</sup>

<sup>1</sup>*Field Science Center for Northern Biosphere, Hokkaido University, Japan*, <sup>2</sup>*Graduated school of environmental Science, Hokkaido University, Japan*, <sup>3</sup>*Graduated school of Environmental Science, Hokkaido University, Japan*, <sup>4</sup>*Yokota Setsubi Co. Ltd.*

**PS2.50 WATER HEATING ANALYSIS UNDER A VENLO TYPE GREENHOUSE DUE TO SOLAR RADIATION**

A. Rojano Aguilar<sup>1</sup>, R. Salazar Moreno<sup>1</sup>, L. Miranda<sup>2</sup>

<sup>1</sup>*Autonomus University of Chaping, Mexico*, <sup>2</sup>*Humboldt-Universität zu Berlin, Germany*

**PS2.51 ASSESSMENT OF ENERGY CONSUMPTION IN GREENHOUSE PRODUCTION IN THE WEST REGION OF PORTUGAL**

F.J. Baptista<sup>1</sup>, D. Murcho, L.L. Silva<sup>1</sup>

<sup>1</sup>*University of Évora, DER/ECT and ICAAM, Évora, Portugal*

## Scientific Program, July, 22

### Oral presentations

8:30 – 9:15 – Invited speaker	Auditorium
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#### RECENT ADVANCES IN WATER AND NUTRIENTS MANAGEMENT OF GREENHOUSE CROPS

S. De Pascale

*Department of Agriculture, University of Naples Federico II, Italy*

9:15 – 10:55 – Oral session O16. Climate control and modelling I	R110
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Chair: P.E. Bournet

OS16.1 **THE VENTILATION JET SYSTEM AS A STEP TOWARDS CONTROLLED VENTILATION AND ADAPTED PROPERTIES OF INSULATION SCREENS IN GREENHOUSES**

P. van Weel<sup>1</sup>

<sup>1</sup>*Wageningen University, Department of Greenhouse Horticulture, The Netherlands*

OS16.2 **PERFORMANCE OF EXTENDED AND UNSCENTED KALMAN FILTERS FOR STATE AND PARAMETER ESTIMATION OF A GREENHOUSE CLIMATE MODEL**

I.L. López Cruz<sup>1</sup>, P.J.M. van Beveren<sup>2</sup>, S. van Mourik<sup>2</sup>, E.J. van Henten<sup>2</sup>

<sup>1</sup>*Dept. of Agricultural Engineering, University of Chapingo, Mexico,* <sup>2</sup>*Farm Technology group, Wageningen University, The Netherlands*

OS16.3 **A HUMIDITY MODEL FOR A CLOSED GREENHOUSE**

R. Salazar Moreno<sup>1</sup>, I.L. López Cruz<sup>1</sup>, U. Schmidt<sup>2</sup>, A. Rojano Aguilar<sup>1</sup>

<sup>1</sup>*Autonomous University of Chapingo, Mexico,* <sup>2</sup>*Humboldt University of Berlin, Germany*

OS16.4 **HYBRID MODELLING FOR A BIOMASS-BASED SYSTEM FOR HEATING AND CO<sub>2</sub> ENRICHMENT**

J.A. Sánchez-Molina<sup>1</sup>, J.L. Guzmán Sánchez<sup>1</sup>, F. Rodríguez Díaz<sup>1</sup>, J. Vicente Reinoso<sup>1</sup>, F.G. Acien<sup>1</sup>

<sup>1</sup>*Univerty of Almería, Spain*

OS16.5 **NUMERICAL AND EXPERIMENTAL STUDY OF HEAT AND MASS TRANSFER IN ALMERÍA-TYPE GREENHOUSE**

F.D. Molina-Aiz<sup>1</sup>, D.L. Valera<sup>1</sup>, A. López<sup>1</sup>

<sup>1</sup>*Universidad de Almería, Spain*

9:15 – 10:55 – Oral session O17. Sustainable production I	R115
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Chair: E. Heuvelink

OS17.1 **ORGANIC SEEDLING PRODUCTION**

Y. Tuzel<sup>1</sup>, G. Oztekin<sup>1</sup>

<sup>1</sup>*Ege University, Faculty of Agriculture, Department of Horticulture, Turkey*

OS17.2 **DOES BIOCHAR IMPROVE SOIL QUALITY AND ORGANIC GREENHOUSE TOMATO PRODUCTIVITY?**

M. Dorais<sup>1</sup>, S. Laurin-Lancôt<sup>2</sup>, C. Ménard<sup>1</sup>, S. Pepin<sup>2</sup>

<sup>1</sup>*Agriculture and Agri-Food Canada, Laval University, Quebec, QC, Canada,* <sup>2</sup>*Dept. of Soil and Agri-Food Engineering, Laval University, Quebec, QC, Canada*

- OS17.3 **CULTIVATION OF MICROALGAE IN CLOSED SYSTEMS UNDER ARTIFICIAL LIGHTING**  
C. Scharff<sup>1</sup>, N. Domurath<sup>2</sup>, F. Schroeder<sup>1</sup>, W. Diepenbrock<sup>3</sup>  
<sup>1</sup>University of Applied Sciences Dresden, Germany, <sup>2</sup>INTEGRAR- Institut für Technologien im Gartenbau GmbH, Germany, <sup>3</sup>Martin Luther University Halle-Wittenberg, Germany
- OS17.4 **MICROECONOMICAL AND ENVIRONMENTAL SUSTAINABILITY OF PORTUGUESE GREENHOUSE HORTICULTURE: A CRITICAL ASSESSMENT**  
J.M. Costa<sup>1</sup>, M. Reis<sup>2</sup>, J.A. Passarinho<sup>3</sup>, M.E. Ferreira<sup>3</sup>, D.P.F. Almeida<sup>4</sup>  
<sup>1</sup>ISA, Universidade de Lisboa, Portugal and ITQB, Universidade Nova de Lisboa, Portugal, <sup>2</sup>FCT, Universidade do Algarve, Portugal, <sup>3</sup> INIAV, I.P., Portugal, <sup>4</sup>ISA, Universidade de Lisboa, Portugal
- OS17.5 **FORCING CULTURE OF WITLOOF CHICORY (CICHORIUM INTYBUS L.) BY USING FERMENTATION HEAT OF COW'S MANURE**  
T. Kumano<sup>1</sup>, H. Araki<sup>2</sup>  
<sup>1</sup>Graduate School of Environmental Science, Hokkaido University, Japan, <sup>2</sup>Field Science Center for Northern Biosphere, Hokkaido University, Japan

9:15 – 10:55 – Oral session O18. Fertigation, water and growing medium management I	R131
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Chair: Y. Tuzel

- OS18.1 **MODELLING THE STOMATAL RESISTANCE UNDER WATER COMFORT AND RESTRICTION TO ASSESS THE TRANSPIRATION OF A GREENHOUSE NEW GUINEA IMPATIENS CROP**  
H. Bouhoun Ali<sup>1</sup>, E. Chantoiseau<sup>1</sup>, P.E. Bournet<sup>1</sup>, P. Cannavo<sup>1</sup>, S. Charpentier<sup>1</sup>, C. Migeon<sup>1</sup>  
<sup>1</sup>Agrocampus Ouest, UP EPHor Environmental Physics and Horticulture Research Unit, France
- OS18.2 **EVALUATION OF SEASONAL, VARIETAL, AND AERATION EFFECTS ON BIOMASS PRODUCTION IN HYDROPONIC GREENHOUSE LETTUCE**  
E. Hernandez<sup>1</sup>, G. Giacomelli<sup>1</sup>, M.D. Lewis<sup>2</sup>  
<sup>1</sup>University of Arizona, USA, <sup>2</sup>Arizona Vegetable Company, USA
- OS18.3 **NUTRIENT UPTAKE CONCENTRATIONS OF A PEPPER\_CROP UNDER MEDITERRANEAN CLIMATE CONDITIONS**  
A. Ropokis<sup>1</sup>, N. Katsoulas<sup>2</sup>, P. Giagtzoglou<sup>1</sup>, S. Ginosatis<sup>1</sup>, G. Ntatsi<sup>1</sup>, D. Savvas<sup>1</sup>  
<sup>1</sup>Agricultural University of Athens, Greece, <sup>2</sup>University of Thessaly, Greece
- OS18.4 **COMBINATION OF GREENHOUSE AND OPEN FIELD CROPS FERTIRRIGATION CAN INCREASE SUSTAINABILITY OF HORTICULTURAL CROPS IN THE MEDITERRANEAN AREA**  
P. Muñoz<sup>1</sup>, J.I. Montero<sup>1</sup>, A. Anton<sup>1</sup>  
<sup>1</sup>IRTA, Spain

11:30 – 13:10 – Oral session O19. Climate control and modelling II	R110
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Chair: J.I. Montero

- OS19.1 **MEASUREMENTS OF WHOLE CANOPY WATER USE EFFICIENCY IN A FAN VENTILATED GREENHOUSE**  
M. Teitel<sup>1</sup>  
<sup>1</sup>ARO-Volcani Center, Israel

**OS19.2 GREENHOUSE CLIMATE CONTROL BASED ON CROP PHOTOSYNTHESIS MEASUREMENTS**

J.A. Dieleman<sup>1</sup>, J. Bontsema<sup>1</sup>, H. Jalink<sup>2</sup>, A. Elings<sup>1</sup>, F. Kempkes<sup>1</sup>, S. Pot<sup>3</sup>, E. Meinen<sup>1</sup>

<sup>1</sup>Wageningen UR Greenhouse Horticulture, The Netherlands, <sup>2</sup>PhenoVation, <sup>3</sup>PlantDynamics

**OS19.3 ARTIFICIAL NEURAL NETWORKS FOR SIMULATION OF TRANSPIRATION AND PHOTOSYNTHESIS IN A SEMI-CLOSED GREENHOUSE**

L. Miranda<sup>1</sup>, T. Rockschi<sup>1</sup>, B. Lara<sup>2</sup>, D. Dannehl<sup>1</sup>, U. Schmidt<sup>1</sup>

<sup>1</sup>Humboldt-Universität zu Berlin, Germany, <sup>2</sup>Universidad Autónoma del Estado de Morelos, Mexico

**OS19.4 ARTIFICIAL NEURAL NETWORKS FOR PREDICTION OF PHOTOSYNTHESIS RATE OF CAPSICUM PLANTS FROM GREENHOUSE MICROCLIMATE DATA**

E. Davarynejad<sup>1</sup>, A. Blievernicht<sup>1</sup>, Z.G. Karimiani<sup>2</sup>, C. Ulrichs<sup>1</sup>

<sup>1</sup>Humboldt-Universität zu Berlin Lebenswissenschaftliche Fakultät Albrecht Daniel Thaer, Institute of Agriculture and Horticultural science, Germany, <sup>2</sup>Leibniz University of Hannover, Faculty of Natural Sciences Institute of Horticulture Production Systems, Floriculture, Germany

11:30 – 13:10 – Oral session O20. Sustainable production II and Environmental impacts

R115

Chair: M. Dorais

**OS20.1 WATER-EFFICIENT ZERO-EMISSION GREENHOUSE CROP PRODUCTION**

E. Beerling<sup>1</sup>, C. Blok<sup>1</sup>, J. Janse<sup>1</sup>, A. Lee<sup>2</sup>, E. van Os<sup>1</sup>, J. van Ruijven<sup>1</sup>

<sup>1</sup>Wageningen UR Greenhouse Horticulture, The Netherlands, <sup>2</sup>Grodan

**OS20.2 PLASTIC FILMS AND SOIL MANAGEMENT INTERACTION ON ORGANIC SUGRATHIRTEEN® TABLE GRAPES IN APULIA REGION**

L. Tarricone<sup>1</sup>, G. Masi<sup>1</sup>, A.M. Amendolagine<sup>1</sup>, D. Di Gennaro<sup>1</sup>, G. Gentile<sup>1</sup>, E. Schettini<sup>2</sup>, G. Vox<sup>2</sup>

<sup>1</sup>Consiglio per la Ricerca e la Sperimentazione in Agricoltura - Research Unit for Viticulture and Enology in Southern Italy, Italy, <sup>2</sup>Department of Agricultural and Environmental Science DISAAT – University of Bari, Italy

**OS20.3 LAND ANALYSIS OF AGRICULTURAL PLASTIC WASTES PRODUCTION IN A SOUTH ITALY AREA BY MEANS OF A GEOGRAPHICAL INFORMATION SYSTEM**

R.V. Loisi<sup>1</sup>, C. Sica<sup>1</sup>, I. Blanco<sup>1</sup>, E. Schettini<sup>1</sup>, G.S. Mugnozza<sup>1</sup>, G. Vox<sup>1</sup>

<sup>1</sup>Department of Agricultural and Environmental Science DISAAT – University of Bari Bari, Italy

**OS20.4 CAN INTERMITTENT-DIRECT-ELECTRIC-CURRENT (IDC) BE CONSIDERED AS STRESS ELICITOR IN PLANTS?**

D. Dannehl<sup>1</sup>, S. Huyskens-Keil<sup>1</sup>, C. Ulrichs<sup>1</sup>, U. Schmidt<sup>1</sup>

<sup>1</sup>Humboldt-Universität zu Berlin, Germany

11:30 – 13:10 – Oral session O21. Fertigation II and Equipment, robotic and automation

R131

Chair: J.E. Son

**OS21.1 CROP TEMPERATURE MEASUREMENTS FOR CROP WATER STATUS IDENTIFICATION IN GREENHOUSES**

C. Kittas<sup>1</sup>, A. Elvanidi<sup>1</sup>, K.P. Ferentinis<sup>2</sup>, T. Bartzanas<sup>2</sup>, N. Katsoulas<sup>1</sup>

<sup>1</sup>University of Thessaly, Dept. of Agriculture Crop Production and Rural Environment, Greece,  
<sup>2</sup>Centre for Research and Technology - Hellas, Institute for Research and Technology of Thessaly, Greece

**OS21.2 MULTISPECTRAL FLUORESCENCE SIGNATURE OF TOMATO LEAVES AND PLANTS: POTENTIAL AND PRACTICAL LIMITATIONS TO SENSE THE IMPACT OF GROWING CONDITIONS**

M. Hunsche<sup>1</sup>, A. Hoffmann<sup>1</sup>, G. Noga<sup>1</sup>

<sup>1</sup>University of Bonn, Germany

**OS21.3 EULERIAN VIDEO MAGNIFICATION TECHNIQUE FOR REVEALING COLOR SUBTLE CHANGES OF FRUIT SKIN**

L. Li<sup>1</sup>, Q. Zhang<sup>2</sup>, D. Huang<sup>1</sup>

<sup>1</sup>Shanghai Jiao Tong University, China, <sup>2</sup>Washington State University, USA

**OS21.4 PARAMETER ESTIMATION AND TUNING OF THE SATURATED PD CONTROL USING CUCKOO SEARCH ALGORITHM APPLIED IN A CUTTING PLANT TISSUE SYSTEM**

J.G. Cebada Reyes<sup>1</sup>, F.H. Schlam<sup>1</sup>, A. Ruiz Garcia<sup>1</sup>, I.L. López Cruz<sup>1</sup>, P. Sanchez Sanchez<sup>2</sup>

<sup>1</sup>University of Chapingo, Mexico, <sup>2</sup>University of Puebla; Mexico

15:00 – 16:40 – Oral session O22. Climate control and modelling III

R110

Chair: L. Marcelis

**OS22.1 DEVELOPMENT OF A GREENHOUSE SIMULATION MODEL TO ESTIMATE THE ENERGY AND RESOURCES NECESSARY FOR ENVIRONMENTAL CONTROLS UNDER VARIOUS CLIMATE CONDITION**

E. Goto<sup>1</sup>, Y. Ishigami<sup>1</sup>, M. Watanabe<sup>1</sup>, L. Okushima<sup>2</sup>

<sup>1</sup>Chiba University, Japan, <sup>2</sup>NARO, Japan

**OS22.2 MULTI-SENSOR DATA FUSION FOR LOW POWER TRANSMISSION OF WIRELESS SENSOR NETWORK IN GREENHOUSE**

R. Wei<sup>1</sup>, L. Xu<sup>1</sup>, X. Wang<sup>1</sup>

<sup>1</sup>Tongji University, Shanghai, China

**OS22.3 DATA-DRIVEN MODELLING TO IMPROVE GREENHOUSE CLIMATE PREDICTIONS**

S. van Mourik<sup>1</sup>, I.L. López Cruz<sup>2</sup>, P.J.M. van Beveren<sup>1</sup>, E.J. van Henten<sup>1</sup>

<sup>1</sup>Farm Technology group, Wageningen University, The Netherlands, <sup>2</sup>Autonomous University of Chapingo, Mexico

**OS22.4 REAL-TIME COMPARISON OF ACTUAL AND PREDICTED CROP TRANSPIRATION IN GREENHOUSE PROCESS CONTROL**

A.N.M. de Koning<sup>1</sup>, I. Tsafaras<sup>2</sup>

<sup>1</sup>HortiMaX, <sup>2</sup>student at Wageningen University, The Netherlands

15:00 – 16:40 – Oral session O23. Plant Protection

R115

Chair: O. Korner

**OS23.1 INSECT EXCLUSION SCREENS: THE SIZE OF THE HOLES FROM A THREE-DIMENSIONAL PERSPECTIVE**

A.J. Álvarez Martínez<sup>1</sup>, R.M. Oliva Molina<sup>1</sup>

<sup>1</sup>University of Almeria, Spain



- OS23.2 **PREDICTION OF PRESENCE AND ABSENCE OF INSECT SPECIES FROM LAND COVER AND CLIMATIC DATA USING AN ADAPTIVE NEURO FUZZY INFERENCE SYSTEM (ANFIS) MODEL**  
E. Davarynejad<sup>1</sup>, C. Ulrichs<sup>2</sup>  
<sup>1</sup>Humboldt-Universität zu Berlin, Albrecht Daniel Thaer Institute of Agriculture- and Horticultural science, Germany, <sup>2</sup>S/S
- OS23.3 **POWDERY MILDEW RESISTANCE IN CUCUMBER SEEDLINGS IS REDUCED UNDER LOWER CO<sub>2</sub> CONCENTRATION THAN THE ATMOSPHERIC LEVEL**  
K. Itagaki<sup>1</sup>, T. Shibuya<sup>1</sup>, M. Tojo<sup>1</sup>, R. Endo<sup>1</sup>, Y. Kitaya<sup>1</sup>  
<sup>1</sup>Osaka Prefecture University, Japan
- OS23.4 **EPIDEMIOLOGY AND MANAGEMENT OF IMPATIENS DOWNY MILDEW IN THE UNITED STATES**  
B.R. Harlan<sup>1</sup>, L. Granke<sup>2</sup>, M.K. Hausbeck<sup>1</sup>  
<sup>1</sup>Michigan State University, USA, <sup>2</sup>Dow AgroSciences LLC

#### Poster presentations

17:00 – 18:00 – Poster session III	R129
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#### Climate control and modelling

- PS3.1 **DEHUMIDIFICATION IN A CHINESE SOLAR GREENHOUSE USING DRY OUTDOOR AIR HEATED BY THE ACTIVE HEAT STORAGE-RELEASE SYSTEM**  
B. Zhou<sup>1</sup>, Q. Yang<sup>1</sup>, Y. Zhang<sup>1</sup>, H. Fang<sup>1</sup>, W. Lu<sup>1</sup>  
<sup>1</sup>Institute of Environment and Sustainable Development in Agriculture, Chinese Academy of Agricultural Sciences, China
- PS3.2 **STUDY OF THE MICROCLIMATE OF AN AGRICULTURAL GREENHOUSE WITH HEAT STORAGE DEVICE IN A ROCK BED LOCATED IN SEMI ARID REGION (SOUTH OF ALGERIA)**  
S. Bezar<sup>1</sup>, S.M.A. Bekkouché<sup>1</sup>, A. Benchatti<sup>2</sup>, A. Bouhdjar<sup>3</sup>  
<sup>1</sup>Unité de Recherche Appliquée en Energies Renouvelables, URAER, Centre de Développement des Energies Renouvelables, Ghardaïa, Algeria, <sup>2</sup>Département de Génie Mécanique, Université Amar Telidji-Laghouat, Laghouat, Algeria, <sup>3</sup>Centre de Développement des Energies Renouvelables, Algiers, Algeria
- PS3.3 **CONTROL STRATEGIES FOR GREENHOUSE MICRO-CLIMATE --- A REVIEW**  
L. Xu<sup>1</sup>, C. Zhu<sup>1</sup>, H. Hu<sup>2</sup>  
<sup>1</sup>Tongji University, Shanghai, China, <sup>2</sup>Zhejiang University of Technology, Hangzhou, China
- PS3.4 **THE GREENHOUSES OF ALMERÍA (SPAIN): TECHNOLOGICAL ANALYSIS AND PROFITABILITY**  
D.L. Valera<sup>1</sup>, L.J. Belmonte Ureña<sup>1</sup>, F.D. Molina Aiz<sup>1</sup>, A. Lopez Martinez<sup>1</sup>, F. Camacho Ferre<sup>1</sup>  
<sup>1</sup>Universidad de Almería, Spain
- PS3.5 **ANALYSIS OF THE MICROCLIMATE OF A GREENHOUSE WITH TWO ANTI-INSECT MESHES OF DIFFERENT THREAD DENSITY, 10X20 THREADS CM-2 AND 13X30 THREADS CM-2**  
A. Lopez Martinez<sup>1</sup>, D.L. Valera<sup>1</sup>, F.D. Molina Aiz<sup>1</sup>, M.A. Moreno Teruel<sup>1</sup>, P. Marin Membrive<sup>1</sup>  
<sup>1</sup>Universidad de Almería, Spain
- PS3.6 **APPLICATION OF A MATHEMATICAL MODEL FOR THE OPTIMIZATION OF SOIL HEATING IN CLOSED-GREENHOUSE SOLARIZATION**  
A. D'Emilio<sup>1</sup>  
<sup>1</sup>Dipartimento di Agricoltura, Alimentazione e Ambiente (Di3A) - University of Catania – Italy

- PS3.7 **EFFECTS OF TOMATO LEAF PRUNING AND CROP HEIGHT LOWERING ON AIR TEMPERATURE AND ITS VERTICAL GRADIENTS IN A SCREENHOUSE**  
H.Liang<sup>1</sup>, M. Teitel<sup>1</sup>, H. Alon<sup>2</sup>, D. Harel<sup>2</sup>, S. Laufer<sup>1</sup>  
<sup>1</sup>ARO-Volcani Center, Israel, <sup>2</sup>Besor experimental station, Israel
- PS3.8 **EVALUATION OF CONDENSATION AND ENERGY CONSUMPTION DURING THE NIGHT IN HEATED ROSE GREENHOUSES**  
A.C. Ferreira Filho<sup>1</sup>, P.A.M. Leal<sup>1</sup>, J.F. Meneses<sup>2</sup>  
<sup>1</sup>School of Agricultural Engineering (FEAGRI), University of Campinas (UNICAMP), Brazil, <sup>2</sup>High Institute of Agronomy (ISA), University of Lisbon, Lisbon, Portugal
- PS3.9 **MICROCLIMATE IN NATURALLY VENTILATED TUNNEL GREENHOUSES: EFFECTS OF PASSIVE HEATING AND GREENHOUSE COVER**  
H. Liang<sup>1</sup>, D. Shapiro<sup>2</sup>, U. Adler<sup>3</sup>, D. Silverman<sup>4</sup>, V. Lukyanov<sup>1</sup>, O. Achiman<sup>1</sup>, S. Cohen<sup>1</sup>, J. Tanny<sup>1</sup>  
<sup>1</sup>Institute of Soil, Water and Environmental Sciences, Agricultural Research Organization, Volcani Center, Israel, <sup>2</sup>Eden Research Center, Mayanot Valley R&D, Israel, <sup>3</sup>Israeli Plant Board, Israel, <sup>4</sup>Ministry of Agriculture, Extension Service, Israel
- PS3.10 **DEVELOPMENT OF THE OPERATION METHOD OF A FOG COOLING SYSTEM BY CONTROLLING THE FOG GENERATION RATE AND VENTILATION RATE OF THE FORCED VENTILATION**  
Y. Ishigami<sup>1</sup>, T. Asai<sup>1</sup>, E. Goto<sup>1</sup>  
<sup>1</sup>Chiba University, China
- PS3.11 **FIRST RESULTS OF IBUTTON LOGGERS AND INFRARED CAMERA APPLICATION INSIDE A GREENHOUSE**  
M. Vallone<sup>1</sup>, G. Aiello<sup>1</sup>, R. Sciortino<sup>1</sup>, P. Catania<sup>1</sup>  
<sup>1</sup>University of Palermo, Italy
- PS3.12 **COMPARISON OF VAPOUR PRESSURE DEFICIT VARIATION IN TRADITIONAL HIGH PLASTIC TUNNEL AND THE TUNNEL EQUIPPED WITH HEAT ACCUMULATOR DURING THE TOMATO CULTIVATION**  
W. Treder<sup>1</sup>, P. Konopacki<sup>1</sup>, K. Klamkowski<sup>1</sup>  
<sup>1</sup>Research Institute of Horticulture, Poland
- PS3.13 **LEAF BOUNDARY LAYER THICKNESS MEASUREMENT IN FORCED VENTILATION CONDITION**  
J.Y. Chen<sup>1</sup>, C. Chen<sup>1</sup>  
<sup>1</sup>Dpt. of Bio-industrial Mechatronics Engineering, National ChungHsing University, Taiwan
- PS3.14 **A DYNAMIC MODEL SIMULATING THE SYMBIOTIC EFFECTS IN AQUAPONIC SYSTEMS**  
O. Körner<sup>1</sup>, P.R. Kledal<sup>2</sup>, E. Gutzmann<sup>3</sup>  
<sup>1</sup>AgroTech - Institute for Agri Technology and Food Innovation, Denmark, <sup>2</sup>Institute for Global Food and Farming, Denmark, <sup>3</sup>AKVA Group Denmark A/S
- PS3.15 **FINDING OPTIMAL TEMPERATURES TO MAXIMIZE LEAF PHOTOSYNTHESIS IN A TOMATO OR CUCUMBER CROP IN HEATED GLASSHOUSE**  
B. Albert<sup>1</sup>, S. Le Quillec<sup>1</sup>, D. Lesourd<sup>1</sup>, D. Loda<sup>1</sup>, R. Barette<sup>1</sup>, E. Brajeul<sup>1</sup>  
<sup>1</sup>CTIFL, France
- PS3.16 **THE STUDY OF SOLAR GREENHOUSE TEMPERATURE AND IRRIGATION CONTROL MODELING BASED ON ADAPTIVE FUZZY NEURAL NETWORK IN DIFFERENT SEASONS**  
C. He<sup>1</sup>, L. Ma<sup>1</sup>, Z. Zhang<sup>1</sup>  
<sup>1</sup>Institute of Vegetables and Flowers, Chinese Academy of Agricultural Sciences, China

- PS3.17 **ARBUSCULAR MYCORRHIZAL FUNGI: PRODUCTION AND QUALITY OF STRAWBERRY FRUIT**  
R. Antonioli<sup>1</sup>, E.O. Calvete<sup>1</sup>, J.L.T. Chiomento<sup>1</sup>, M.V.P. Minosso<sup>1</sup>, A.C. Pedersen<sup>1</sup>, F.S. De Nardi<sup>1</sup>,  
R.C. Costa<sup>1</sup>  
<sup>1</sup>*University of Passo Fundo, Brazil*
- PS3.18 **CHEMICAL CHARACTERISTICS AND PRODUCTION OF STRAWBERRY INOCULATED WITH MYCORRHIZAL**  
R. Antonioli<sup>1</sup>, E.O. Calvete<sup>1</sup>, J.L.T. Chiomento<sup>1</sup>, A.C. Pedersen<sup>1</sup>, A.P. Cecatto<sup>1</sup>, F.S. De Nardi<sup>1</sup>,  
R.C. Costa<sup>1</sup>  
<sup>1</sup>*University of Passo Fundo, Brazil*
- PS3.19 **TOTAL POLYPHENOL EXTRACTION METHODS AND FERRIC REDUCING ANTIOXIDANT POWER OF ARTICHOKE SEEDLINGS**  
A.C. Pedersen<sup>1</sup>, E.O. Calvete<sup>1</sup>, F.S. De Nardi<sup>1</sup>, R.C. Costa<sup>1</sup>, A.R. Costa<sup>1</sup>, C.T. Oliveira Neto<sup>1</sup>  
<sup>1</sup>*University of Passo Fundo, Brazil*
- PS3.20 **MYCORRHIZAL INOCULUM POTENTIAL IN STRAWBERRY CROPS IN RIO GRANDE DO SUL**  
A.C. Pedersen<sup>1</sup>, E.O. Calvete<sup>1</sup>, F.S. De Nardi<sup>1</sup>, M.V.P. Minosso<sup>1</sup>, R.C. Costa<sup>1</sup>  
<sup>1</sup>*University of Passo Fundo, Brazil*
- PS3.21 **NUTRIENT BALANCE IN ACUAPONIC LETTUCE PRODUCTION**  
J. Pineda Pineda<sup>1</sup>, E.A. Pérez-Gómez<sup>1</sup>, I.N. García-Antonio<sup>1</sup>, I. Miranda-Velázquez<sup>1</sup>, J. E. Rodríguez-Pérez<sup>1</sup>, J. A. Ramírez-Arias<sup>1</sup>  
<sup>1</sup>*Universidad Autónoma Chapingo, Mexico*
- PS3.22 **BIOPLASTICS AND BIOCOMPOSITES FOR SUSTAINABLE HORTICULTURAL CONTAINERS: PERFORMANCE AND BIODEGRADATION IN HOME COMPOST**  
J.A. Schrader<sup>1</sup>, K.G. McCabe<sup>1</sup>, D. Grewell<sup>1</sup>, W.R. Graves<sup>1</sup>  
<sup>1</sup>*Iowa State University, USA*
- PS3.23 **ECONOMIC AND ENVIRONMENTAL EVALUATION OF PLASTIC HOUSE HEATING SYSTEM WITH USED HOT WATER OF HOTEL'S SPA AND SURPLUS HEAT FROM MACHINERY ROOM**  
H. Araki<sup>1</sup>, S. Yamagata<sup>2</sup>, S. Fujiwara<sup>3</sup>, M. Fujii<sup>3</sup>  
<sup>1</sup>*Field Science Center for Northern Biosphere, Hokkaido University, Japan*, <sup>2</sup>*Graduated school of Engineering, Hokkaido University, Japan*, <sup>3</sup>*Graduated school of Environmental Science, Hokkaido University, Japan*
- PS3.24 **EVALUATION OF PRODUCTION OF THREE BLACKBERRY (RUBUS GLAUCUS) CULTIVARS IN A MEDITERRANEAN-TYPE GREENHOUSE**  
A. González<sup>1</sup>, E. Martín<sup>1</sup>, M.R. Celestino<sup>1</sup>, M.C. García García<sup>1</sup>  
<sup>1</sup>*IFAPA, La Mojonera, Spain*
- PS3.25 **TOMATO CULTIVATION IN AN AQUAPONIC SYSTEM**  
J. Pineda-Pineda<sup>1</sup>, I. Miranda-Velázquez<sup>2</sup>, J. A. Ramírez-Arias<sup>2</sup>, E del C. Moreno-Pérez<sup>3</sup>, J. J. T. Morales-Parada<sup>2</sup>, V. Morales-Gaspar<sup>3</sup>  
<sup>1</sup>*Departamento de Suelos, Universidad Autónoma Chapingo, Mexico*, <sup>2</sup>*Preparatoria Agrícola, Universidad Autónoma Chapingo, Mexico*, <sup>3</sup>*Departamento de Fitotecnia, Universidad Autónoma Chapingo, Mexico*

- PS3.26 **ANALYSIS OF CO<sub>2</sub> BALANCE IN A CLOSED PRODUCTION SYSTEM OF MUSHROOM AND LETTUCE**  
D.H. Jung<sup>1</sup>, J.E. Son<sup>1</sup>  
<sup>1</sup>*Seoul National University, Korea*
- PS3.27 **CONSTRUCTION AND VALIDATION OF A TEMPORARY IMMERSION SYSTEM FOR VEGETABLE MICROPROPAGATION AGAVES**  
 E. Mujica Rodriguez<sup>1</sup>, M. Carrillo Garcia<sup>1</sup>, J.L. Rodriguez de la O<sup>1</sup>, J.G. Cebada Reyes<sup>1</sup>  
<sup>1</sup>*Autonomous University of Chapingo, Mexico*
- PS3.28 **EFFECT OF DIFFERENT PHOTOPERIODS ON THE BIOCHEMICAL PROFILE OF THE GREEN ALGAE C. VULGARIS AND S. OBLIQUUS**  
 C. Scharff<sup>1</sup>, N. Domurath<sup>2</sup>, F.G. Schroeder<sup>1</sup>, W. Diepenbrock<sup>3</sup>  
<sup>1</sup>*University of Applied Sciences Dresden, Germany*, <sup>2</sup>*INTEGRAR- Institut für Technologien im Gartenbau GmbH, Germany*, <sup>3</sup>*Martin Luther University Halle-Wittenberg, Germany*
- PS3.29 **THE EFFECT OF GRAFTING ON SALINITY TOLERANCE IN CUCUMBER PLANTS GROWN IN PERLITE**  
A. Gul<sup>1</sup>, O. Cengiz<sup>1</sup>, M. Tepecik<sup>1</sup>  
<sup>1</sup>*Ege University, Faculty of Agriculture, Turkey*

#### Environmental impacts

- PS3.30 **CO<sub>2</sub> SUPPLY TO A GREENHOUSE FROM THE COMBUSTION OF VEGETAL WASTE**  
J.C. López<sup>1</sup>, M.D. Fernández<sup>1</sup>, J. V. Reinoso<sup>2</sup>, F.G. Acién<sup>2</sup>, C. Pérez<sup>1</sup>, J.C. Gázquez<sup>1</sup>  
<sup>1</sup>*Research Station Cajamar 'Las Palmerillas', Fundación Cajamar- Grupo Cooperativo Cajamar, Spain*, <sup>2</sup>*Department of Chemical Engineering, University of Almería, Almería, Spain*
- PS3.31 **VEGETATION AS PASSIVE SYSTEM FOR ENHANCING BUILDING CLIMATE CONTROL SUSTAINABILITY**  
 I. Blanco<sup>1</sup>, E. Schettini<sup>1</sup>, G.S. Mugnozza<sup>1</sup>, C.A. Campiotti<sup>2</sup>, G. Giagnacovo<sup>2</sup>, G. Vox<sup>1</sup>  
<sup>1</sup>*Department of Agricultural and Environmental Science DISAAT – University of Bari, Italy*, <sup>2</sup>*ENEA - Italian National Agency for New Technologies, Energy and Sustainable Economic Development, Rome, Italy*
- PS3.32 **SAFETY IN PROTECTED CROPS: CURRENT STATUS IN WESTERN SICILY**  
P. Catania<sup>1</sup>, M. Vallone<sup>1</sup>  
<sup>1</sup>*University of Palermo, Italy*
- PS3.33 **DOUBLE USE OF WATER TREATMENT IN SOILLESS GROWING SYSTEMS: DISINFECTION AND REMOVAL OF PLANT PROTECTION PRODUCTS**  
 J. van Ruijven<sup>1</sup>, E. Beerling<sup>1</sup>, E. van Os<sup>1</sup>, C. Haan<sup>2</sup>  
<sup>1</sup>*Wageningen UR Greenhouse Horticulture, Greece*, <sup>2</sup>*Agrozone*

#### Fertigation, water and growing medium management

- PS3.34 **EVALUATION OF THE PERFORMANCE OF FOUR TYPES OF SUBSTRATE MOISTURE AND EC METERS**  
C. Wang<sup>1</sup>, C. Chen<sup>1</sup>  
<sup>1</sup>*National Chung Hsing University, Taiwan*

- PS3.35 **NUTRIENT SOLUTIONS FOR PROTECTED VEGETABLE PRODUCTION IN TROPICAL AND SUBTROPICAL TAIWAN**  
T.C. Shen<sup>1</sup>, C.Y. Tai<sup>2</sup>, J. Hughes<sup>1</sup>, L.T. Kuo<sup>1</sup>, W.Y. Chen<sup>1</sup>  
<sup>1</sup>AVRDC – The World Vegetable Center, 60 Yi-Min Liao, Shanhua, Tainan, Taiwan, <sup>2</sup>Taichung District Agricultural Research and Extension Station, Council of Agriculture, Changhua, Taiwan
- PS3.36 **THE POSSIBILITY OF PREDICTING MIXED SOILLESS MEDIA PHYSICAL PROPERTIES THROUGH COMPONENTS' CHARACTERISTICS**  
M. Delshad<sup>1</sup>, H.M. Manghabadi<sup>1</sup>, A.K. Kashi<sup>1</sup>  
<sup>1</sup>Dept. of Horticultural Science, College of Agriculture & Natural Resources, University of Tehran, Iran
- PS3.37 **COMPARISON OF SEEDLING QUALITY AND ROOT SYSTEM BETWEEN ELLEPOT AND PLUG TRAY SYSTEM IN FRUIT VEGETABLES SEEDLINGS**  
S.H. Kim<sup>1</sup>, N.T. Vu<sup>1</sup>, A. Obyedul-Kalam<sup>1</sup>, K.Y. Choi<sup>2</sup>, I.S. Kim<sup>1</sup>  
<sup>1</sup>Department of Horticulture, Kangwon National University, Chuncheon, Korea, <sup>2</sup>Department of Controlled Agriculture, Kangwon National University, Chuncheon, Korea
- PS3.38 **AGRONOMICAL RESPONSES OF CONTAINERIZED ORNAMENTAL SHRUBS TO SALINITY INDUCED BY MAJOR NUTRIENTS**  
G. Fascella<sup>1</sup>, P. Maggiore<sup>1</sup>, M.M. Mammano<sup>1</sup>, Y. Roupael<sup>1</sup>, S. De Pascale<sup>2</sup>  
<sup>1</sup>Consiglio per la Ricerca e Sperimentazione in Agricoltura, Unità di Ricerca per il recupero e la valorizzazione delle Specie Floricole Mediterranee, Italy, <sup>2</sup>University of Naples Federico II, Italy
- PS3.39 **COMPARISON OF PASSIVE AND ACTIVE METHODS OF SOIL SOLUTION SAMPLING FOR FERTIGATION CONTROL IN A MEDITERRANEAN GREENHOUSE**  
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- PS3.43 **EFFECT OF WATER SALINITY AND OSMOLYTES APPLICATION ON GROWTH AND ORNAMENTAL VALUE OF VIBURNUM TINUS L. 'LUCIDUM'**  
M.I. Sifola<sup>1</sup>, C. Cirillo<sup>1</sup>, Y. Roupael<sup>1</sup>, R. Caputo<sup>1</sup>, A. Pannico<sup>1</sup>, G. Raimondi<sup>1</sup>, E. Di Stasio<sup>1</sup>, S. De Pascale<sup>1</sup>  
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- PS3.46 **STUDY ON BIOACTIVE SUBSTANCES IN MEDICINAL AND AROMATIC PLANTS CULTIVATED IN HYDROPONIC AND AEROPONIC SYSTEMS**  
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T.I. Ahn<sup>1</sup>, J.H. Shin<sup>1</sup>, J.W. Lee<sup>1</sup>, D.H. Jung<sup>1</sup>, J.E. Son<sup>1</sup>  
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R. Seligmann<sup>1</sup>, A. Bar-Tal<sup>2</sup>, A. Schwartz<sup>1</sup>, U. Yermiyahu<sup>3</sup>  
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N. Mori<sup>1</sup>, H. Watanabe<sup>1</sup>  
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G. Raimondi<sup>1</sup>, Y. Rouphael<sup>1</sup>, E. Di Stazio<sup>1</sup>, F. Napolitano<sup>1</sup>, G. Clemente<sup>1</sup>, S. De Pascale<sup>1</sup>  
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**PS3.53 LOW SUBSTRATE PH AFFECTS PLANT GROWTH, WITHOUT INDUCING LEAF SYMPTOMOLOGY, OF PETUNIA AND POINSETTIA**

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**PS3.54 CHARACTERIZATION OF NUTRIENT DISORDERS OF PELARGONIUM PELTATUM**

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**PS3.55 GROWTH AND TOTAL PHENOLIC CONCENTRATION OF DROPWORT GROWN IN SEVERAL HYDROPONIC SYSTEMS AND EC LEVELS OF NUTRIENT SOLUTION**

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**Equipment, robotic and automation**

**PS3.57 TECHNOLOGICAL FEATURES AND ELEMENTS OF ECONOMIC EFFICIENCY REGARDING THE SEMI-AUTOMATIC GRAFTING OF VEGETABLES**

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**PS3.58 DEVELOPMENT OF ARTIFICIAL POLLINATION SYSTEM USING ULTRASONIC RADIATION PRESSURE**

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**PS3.59 THE “SPECIALSERRE” SPRAYER FOR PESTICIDE DISTRIBUTION IN GREENHOUSE: CHRYSANTHEMUM CROP CASE STUDY**

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**Plant Protection**

**PS3.60 INSECT-PROOF SCREENS, PESTS AND OTHER FACTORS**

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**PS3.61 MODE OF ACTION AND EFFECTIVENESS OF BACILLUS FIRMUS I-1582 AGAINST MELOIDOGYNE SPP. ON VEGETABLE CROPS**

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**PS3.62 INFLUENCE OF SOIL COVERING ON BOTRYTIS CINEREA INCIDENCE AND ON THE PRODUCTIVITY OF A TOMATO CROP GROWN IN UNHEATED GREENHOUSES**

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- PS3.63 **PEST-SPECIFIC EFFECTS OF ATMOSPHERIC MOISTURE ON PLANT–HERBIVORE INTERACTIONS THROUGH THE RESPONSES OF HOST CUCUMBER PLANTS**  
T. Shibuya<sup>1</sup>, N. Hirai<sup>1</sup>, S. Ueyama<sup>1</sup>, K. Itagaki<sup>1</sup>, Y. Sakamoto<sup>1</sup>  
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- PS3.64 **EFFECT OF GREEN MANURE ON PHYSIOLOGY AND QUALITY OF ORGANICALLY GROWN TOMATO**  
Y. Fleury<sup>1</sup>, C. Gilli<sup>1</sup>, C. Camps<sup>1</sup>  
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Y.Y. Cho<sup>1</sup>, Y.A. Jeun<sup>1</sup>, M.K. Cha<sup>1</sup>, J.M. Choi<sup>2</sup>  
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