PROCEEDINGS OF THE INTERNATIONAL SYMPOSIUM ON GROWING MEDIA AND SOILLESS CULTIVATION

GroSci 2013

Co-Conveners

C. Blok
E. van Os
W. Voogt

Leiden, The Netherlands

June 17-21, 2013

ISHS Commission Plant Substrates and Soilless Culture
ISHS Working Group Growing Media
ISHS Working Group Composting for Horticultural Applications
ISHS Working Group Substrate Analysis
ISHS Working Group Hydroponics
ISHS Working Group Aquaponics
International Peat Society

Acta Horticulturae 1034
May 2014
### LIST OF CONTENTS

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreword</td>
<td>6</td>
</tr>
<tr>
<td>Preface</td>
<td>7</td>
</tr>
<tr>
<td>List of Contents</td>
<td>9</td>
</tr>
<tr>
<td>List of Authors</td>
<td>15</td>
</tr>
<tr>
<td>List of Participants</td>
<td>17</td>
</tr>
</tbody>
</table>

### Water Use Efficiency

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horticultural Production in Greenhouses: Efficient Use of Water</td>
<td>25</td>
</tr>
<tr>
<td>C. Stanghellini</td>
<td></td>
</tr>
<tr>
<td>Degradation of Pesticides in Nutrient Solution from Closed Hydroponic Systems</td>
<td>33</td>
</tr>
<tr>
<td>B.W. Alsanius and K.-J. Bergstrand</td>
<td></td>
</tr>
<tr>
<td>Valorisation of Discharge Water from Substrate-Grown Crops in Greenhouses</td>
<td>41</td>
</tr>
<tr>
<td>J. Balendonck, E.A. van Os, J.P.M. van Ruijven, C. van der Lans, E. Beerling and L. Feenstra</td>
<td></td>
</tr>
<tr>
<td>Closing the Water and Nutrient Cycles in Soilless Cultivation Systems</td>
<td>49</td>
</tr>
<tr>
<td>E.A.M. Beerling, C. Blok, A.A. van der Maas and E.A. van Os</td>
<td></td>
</tr>
<tr>
<td>Defining Rain Garden Filter Bed Substrates Based on Saturated Hydraulic Conductivity</td>
<td>57</td>
</tr>
<tr>
<td>H. Kraus, T. Bilderback, R. Pledger, E. Riley, B. Fonteno and B. Jackson</td>
<td></td>
</tr>
<tr>
<td>Use of a Phytotoxicity Test to Screen Drain Water before Re-Use</td>
<td>65</td>
</tr>
<tr>
<td>C. Blok, P. de Boer-Tersteeg, B. van der Maas, R. Khodabaks and N.L.M. Enthoven</td>
<td></td>
</tr>
<tr>
<td>Reducing Emission of Nutrients and Plant Protection Agents from Horticulture with Advanced Oxidation by Hydrogen Peroxide and Medium Pressure UV Light</td>
<td>71</td>
</tr>
<tr>
<td>N.L.M. Enthoven and D. Zwartveld</td>
<td></td>
</tr>
<tr>
<td>The Effects of Applications which Increase the O$_2$ of the Water on Yield and Quality of Lettuce Grown in a Floating System</td>
<td>77</td>
</tr>
<tr>
<td>N. Ercan and R. Bayyurt</td>
<td></td>
</tr>
<tr>
<td>Reduction of Nutrient Run-Off by the Use of Coated Slow-Release Fertilizers on Two Container-Grown Nursery Crops</td>
<td>85</td>
</tr>
<tr>
<td>C. Diara, L. Incrocci, G. Incrocci, G. Carmassi, A. Pardossi, P. Marzialetti, P. Cozzi, F. Fibbi and R. Clemens</td>
<td></td>
</tr>
<tr>
<td>Implementation of Sensor-Controlled Decision Irrigation Scheduling in Pot-in-Pot Nursery Production</td>
<td>93</td>
</tr>
<tr>
<td>J.D. Lea-Cox and B.E. Belayneh</td>
<td></td>
</tr>
<tr>
<td>Growth Inhibition, the Use of Advanced Oxidation and the Reduction of Nutrient Solution Discharge in Practice</td>
<td>101</td>
</tr>
<tr>
<td>M.G.M. Raaphorst, A.A. van der Maas, C. Blok, E.A.M. Beerling and N.L.M. Enthoven</td>
<td></td>
</tr>
</tbody>
</table>
Growing Media

An Experimental Comparison of Growing Media, Petunia Quality and Amount of Water Applied – An Opportunity for Water Saving?
*P. Alexander, R. Williams and I. Nevison* 211

Defining Sustainable Growing Media for Sustainable UK Horticulture
*P.D. Alexander and N.C. Bragg* 219

Greenhouse Cultivation of Bitter Gourd (*Momordica charantia* L.) in Mineral and Organic Substrate
*M.H. Böhme, I. Pinker and S. Edenharter* 227

Physical Properties and Water Uptake in Peat-Based Growing Media Containing Green Compost
*D. NiChualain, C. Hynes and W.C. Carlile* 233

Efficacy of Ground Fresh Rice Hulls as a Substrate Component for Greenhouse Crops Production Using Overhead and Ebb-and-Flood Irrigation Systems
*M.R. Evans* 241

Effect of Solution Electrical Conductivity (EC) and Pre-Plant Nutrient Form on the pH of a Peat-Perlite Substrate
*P.R. Fisher, R.W. Dickson, G.S. Mohammad-Pour and J. Huang* 249

Experiences with the OUR Method EN 16087-1: Interpretation of Pressure Curves and Effect of Method Deviations
*W.H.C. Geuijen and J.B.G.M. Verhagen* 255

Overview of New Quality Control Procedures in Container Growing Substrates for Young Plant Production
*J. Huang and P.R. Fisher* 263

Sustainable Substrates for Plants, Trees and Shrubs Enabled with BioFoam®
*J. Noordegraaf, J. de Jong, P. Matthijsen, P. de Bruijn, T. Baltissen and K. Molenveld* 269

Posidonia-Based Compost as a Growing Medium for the Soilless Cultivation of Tomato
*F.F. Montesano, A. Parente, F. Grassi and P. Santamaria* 277

The Use of Posidonia-Based Compost as Peat Substitute for Transplant Production
*A. Parente, F. Montesano, F. Grassi, C. Mininni and P. Santamaria* 283

The Compost of Posidonia Residues: a Short Review on a New Component for Soilless Growing Media
*A. Parente, F. Serio, F.F. Montesano, C. Mininni and P. Santamaria* 291

Producing Growing Media Responsibly to Help Sustain Horticulture
*G. Schmilewski* 299
Physics of Growing Media in a Green Future

Estimation of Hydraulic Properties of Growing Media with a One-Step Outflow Technique

Developing Quality Standards for Physical Properties of Mineral Wool Plugs

The Influence of the Processing Stage on the Suitable Amount of Coir Dust in Growing Media

Plant Available and Unavailable Water in Greenhouse Substrates: Assessment and Considerations

Importance of Peat Particle Size Effects on Spatial Root Distribution and Changes on Aeration Properties

Temporal Dynamics of Oxygen Concentrations in a Peat-Perlite Substrate

Liming Power of Different Particle Fractions of Biochar

Resilience

Response of Snapdragon (Antirrhinum majus L.) to Blending Water Irrigation and Arbuscular Mycorrhizal Fungi Inoculation

Rhizometrics: A Review of Three In Situ Techniques for Observation and Measurement of Plant Root Systems in Containers

Changes in Bacterial Communities in Dairy Manure during Nine Months of Composting as Determined by Denaturing Gradient Gel Electrophoresis

Changes in Fungal Communities in Dairy Manure during Nine Months of Composting as Determined by Denaturing Gradient Gel Electrophoresis

Effect of Inoculation with Arbuscular Mycorrhizal Fungi (AMF) on Gerbera Cut Flower (Gerbera jamesonii) Production in Soilless Cultivation
Impact of Disease-Suppressive Compost on Soil Quality and Pythium Inoculum Potential
M. Vestberg and S. Kukkonen

Nutrition and Salinity

Recent Trends in Salinity Control for Soilless Growing Systems Management
N. Katsoulas and W. Voogt

Response of Bell-Pepper (Capsicum annuum L.) to Salt Stress and Deficit Irrigation Strategy under Greenhouse Conditions
A.R. AlHarbi, A.M. Saleh, A.M. Al-OMran and M.A. Wahb-Allah

Ionic Strength Effect on pH Dependent Zinc Adsorption by Perlite: Modelling vs. Empirical Results
B. Bar-Yosef, J. Ben Asher and A. Silber

Characterization of Nutrient Disorders of Gazania rigens ‘Daybreak White’
J. Barnes, B.E. Whipker, I. McCall and J. Frantz

Fertilizer Formulation Effect on pH of Fallow Versus Planted Container Substrate
J. Barnes, P. Nelson, B.E. Whipker, D. Hesterberg and W. Shi

Optimizing Fertilizer Rates for Two Cultivars of Graziosa Geraniums
J. Barnes, B.E. Whipker and I. McCall

Effect of Irrigation Duration and Fertilizer Rate on Plant Growth, Substrate Solution EC and Leaching Volume
A. Bayer, K. Whitaker, M. Chappell, J. Ruter and M. van Iersel

Effect of Fertigation and Environmental Conditions on Sweet Pepper Seedlings Quality

A Novel Organo-Mineral Fertilizer Can Alleviate Negative Effects of Salinity Stress for Eggplant Production on Reclaimed Saline Calcareous Soil
W.M. Semida, T.A. Abd El-Mageed and S.M. Howladar

Effect of Electrical Conductivity of the Nutrient Solution on the Growth and Yield of Three Native Tomato Genotypes (Lycopersicon esculentum var. cerasiforme)
P. Juárez-López, D. Reed, M. Kent, P. Ramirez-Vallejo, E. Cruz-Crespo, R. Bugarin-Montoya, J.D. Garcia-Paredes and L. Martínez-Cárdenas

Effect of Electrical Conductivity of the Nutrient Solution on Fruit Quality of Three Native Tomato Genotypes (Lycopersicon esculentum var. cerasiforme)
P. Juárez-López, D. Reed, M. Kent, P. Ramirez-Vallejo, L. Cisneros-Zevallos, S. King, R. Medina-Torres and E. Cruz-Crespo

Development and Evaluation of a DSS for Drainage Management in Semi-Closed Hydroponic Systems
N. Katsoulas, C. Kittas, T. Bartzanas and D. Savvas

13
Development of a Simplified and Highly Nutrient-Efficient Fertilization Method by Using Controlled-Release Fertilizer in Tomato Cultivation  
*T. Kinoshita, M. Sugiura and Y. Nagasaki*

Comparing Controlled Release Fertilizers to Constant Liquid Feed for Zonal Geranium Production  

*Osteospermum* Leaf Tissue Nutrient Sufficiency Ranges by Chronological Age  
*A. Papineau and B.A. Krug*

Effect of Pre and Post Anthesis Foliar Application of Calcium on Postharvest Quality of Gerbera Cut Flower  
*M.J. Nazari Deljou and K. Gholipour*

Nutrient Uptake Concentrations in a Cucumber Crop Grown in a Closed Hydroponic System under Mediterranean Climatic Conditions as Influenced by Irrigation Schedule  
*D. Savvas, G. Ntatsi, M. Rodopoulou and F. Goumenaki*

Monitoring of Greenhouse Irrigation Water Using Microchip Electrophoresis  
*G. van der Lugt, F. van Dijk, J.P. van Erp and G.A.J. Besselink*

Nutrient Uptake of Four Cut Rose Varieties  
*D.M. van der Sar, P.H.B. de Visser and J. Vos*

Reducing Transpiration of Pansies (*Viola × wittrockiana*) with Abscisic Acid and 8'-Acetylene Methyl-Ester Abscisic Acid  
*G.M. Weaver and M.W. van Iersel*

The Effect of Different Silicon Fertilizers on the Greenhouse Cucumber Production  
*A. van Winkel, J. Hofland-Zijlstra, C. Blok, A. Erstad-van der Vlugt, K. Erstad and C. van der Burg*

Fe-Polyphosphate Formulations as Replacement for Fe-Chelates in Nutrient Solutions: Preliminary Experiments with Cucumber (*Cucumis sativus* L.) in Hydroponics  
*W. Voogt and M. IJdo*

Heavy Metals in Animal Manure and Effects of Composting on It  
*M. Vukobratović, Z. Vukobratović, Z. Lončarić and D. Kerovac*

Automated System for Inducing Nutrient Disorders Utilized in Grower-Based Guides: *Exacum affine* ‘Royal Dane Blue’  
*B.E. Whipker, I. McCall, J. Barnes and J. Frantz*

Characterization of Nutrient Disorders of *Solenostemon scutellarioides* ‘Lime Light’ in Silica-Sand Culture  
*Y. Jin, B.A. Fair, B.E. Whipker, I. McCall and J. Frantz*