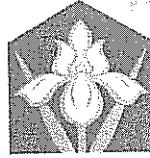


SCIENTIFIC PROGRAM



KV_C009
Viliez, K., Steppe, K., De Pauw, D. J. W. (2009).
On-line Plant Stress Monitoring: a statistical
process control approach. Proceedings of the
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Québec, QC, Canada June 14-19, 2009, 125.

GreenSys 2009

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Loews Le Concorde Hotel
Québec City, Québec, Canada



ORGANIC CROP SYSTEMS

- P124 Organic Melon Cultivation with Integrated Practices in Soil Based Greenhouse
 - P131 Some Effects of Organic Matter Sources over Chemical Composition of Lettuce (*Lactuca Sativa*)
 - P132 Productivity, Quality and Substrate Microbiology of Greenhouse Organic Tomatoes
 - P133 Responses in the Growth and Nitrogen Metabolism in Tomato Seedlings to Different Glycine Concentration under Sterile Hydroponics Cultivation
 - P134 Chemical Composition of Lettuce (*Lactuca Sativa*) as Affected by Organic Matter Sources
 - P140 Effect of Oxygenated Nutrient Solution of Organic Greenhouse Tomato on Soil Biological Activity, Root Disease Tolerance, Plant Growth and Yield
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Wednesday, June 17

EDUCATION AND TRAINING

- P9 Strategic Recommendations for Organic Horticulture Extension in Countries Commencing Organic Production
- P12 The Global Orientation of Wageningen UR Greenhouse Horticulture
- P15 Training as a Tool for Changes in the Horticultural Sector: the Almería Case

ENVIRONMENTAL CONTROL

- P3 Mathematical Modeling and Control for the Greenhouse Climate Conditions in Central Mexico by the Use of Intelligent Algorithms and Mechanistic Models
- P6 A Photoautotrophic Micropropagation System Using Large Vessels with Forced Ventilation for Commercial Application

MICROCLIMATE

- P18 Use of Disposable Film Sensor for Analyzing Uniformity of Daily Light Integral inside a Greenhouse
- P21 Development of a Bio-physical Simulator for Mediterranean Greenhouses
- P24 Measurement of the Condensation Rate in a Venlo-type Glasshouse Grown with a Cucumber Crop in a Mediterranean Area
- P27 Energy Management Decision Support Tool for Greenhouse Growers
- P30 Measurement of the Soil-air Convective Heat Transfer Coefficient from a Greenhouse Mulch Soil
- P33 Airflow at the Openings of a Naturally Ventilated Almería-Type Greenhouse with Insect-proof Screens

ROBOTIC AND SENSORS

- P36 The Greenhouse Effect in the High Tropics of Colombia: A Modeling Approach
- P39 Suitability Evaluation of Four Methods to Estimate Leaf Wetness Duration in a Greenhouse Rose Crop
- P42 On-line Plant Stress Monitoring: a Statistical Process Control approach
- P45 A Study of Simple Measurement Model for Total Leaf Area at Tomato Colony

SUSTAINABLE GROWING SYSTEMS

- P48 Exploring More Sustainable Technological Alternatives for the Greenhouse Cut Flowers Industry in Colombia
- P51 The Closed System Tool Box
- P54 Constructed Wetlands Implanted with *Iris Versicolor*, *Juncus sp.* and *Phragmites Australis* as a Potential Treatment for Greenhouse Effluents.
- P57 The Use of Biodegradable Pots for the Cultivation of *Poinsettia (Euphorbia Pulcherrima)*
- P60 Comparison of Hydroponics and Aquaponics for Greenhouse Strawberry Production
- P63 Effects of $\text{NH}_4^+\text{-N}$ and $\text{NO}_3^-\text{-N}$ Ratio on the Growth and Quality of Bunching Onion under High Temperature Stress
- P66 Effect of the Nitrogen Nutrient on Pigments of Flower Stalk in Chinese Kale
- P69 Effect of Nitrogen and Sulphur on the Growth and Quality of Bunching Onion

advantage over conventional heating setups. Direct measurements of energy consumption for the two test cases indicated 35-40% savings for infrared heated greenhouse. Besides, infrared heating contributed to improved total quality of the cultivated lettuce.

P42

On-line Plant Stress Monitoring: a Statistical Process Control approach

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A new research line is set up envisioning to establish on-line tools for early detection of plant and/or crop stress conditions in view of timely interventions for plant damage prevention. Unfold Principal Component Analysis (U-PCA), a classic yet powerful tool from the chemometrics field, is applied for efficient handling of multivariate data sets. This work describes an application of a fault detection scheme based on principal component analysis (PCA) for living crops. Two crops, young apple trees and truss tomato plants, were used for testing the method. Obtained data consists of 5-minute means of photosynthetically active radiation, vapour pressure deficit and stem diameter variations. The data are reorganized such that a single diurnal cycle is regarded as a separate observation, giving rise to 288 measurements for each measured variable. U-PCA is subsequently applied to the resulting 864-variate dataset for monitoring of both a control plant and a stress plant which is exposed to drought stress during a well-defined period. The first 15 and 10 observations of the apple trees, and tomato plants especially, are used for U-PCA model calibration. In both cases, 1 principal component is selected to be incorporated in the model. By means of the constructed U-PCA model the imposed stress condition for the respective apple tree was detected on the 4th day of the stress period and 7 days before visual signs of turgidity loss were observed. As such, it can be concluded that the U-PCA tool is able to discriminate well between normal and abnormal situations with only 3 days of delay between the start of the drought experiment and its effective detection. For the tomato plant data similar results are obtained. As such, techniques from the field of statistical process control are proven to be promising tools for the on-line monitoring of living crops.

P43

Water Performance of Potted Carnation Affected by Peat-alternative Growing-media Mixtures

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Alternative substrates are being introduced for composing the growing medium. The origin and the proportion of the constituents determine largely the physical and chemical characteristics of the resulting growing medium and consequently its management in the nursery. Water wise use in the nursery is important to maintain productivity and make the nursery plant production environmentally sound. The aim of this study was to evaluate the growth and water performance of potted carnation "Summerdress" cultivar, grown in 4 different growing-media mixtures based on primarily coconut fibre (with two different particle size) and different proportions of peatmoss and vermiculite. A randomized block design with five replicates per treatment and six rooted cuttings per replication was used. Growth plant parameters, relative chlorophyll content (RCC) in leaves and water relations were measured after 20 weeks of cultivation. The water balance was determined throughout the cultivation cycle. At the end of the cultivation cycle the plants grown in the mixtures with more proportion of peatmoss gave the highest fresh and dry weight, the highest number of shoots and flowers per plant and the highest chlorophyll content of leaves. The water balance showed a greater consumption of water, which was a 12.9% higher in the substrate mixtures with higher proportion of peatmoss compared to lower ones. The water relations were not significantly affected by the components variation, showing all treatments high leaf water potential values, which may indicate a well plant hydration status. The photosynthetic rate and the stomatal conductance were not significantly affected by the components variation, this suggest a well transpirative capacity in all cases.

P44

A Multifunction Dehumidifying Heat Pump for Greenhouses

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The improvements in greenhouse structure and equipment with the aim of saving energy (double walls, thermal screens) have led to better insulation and airtightness but also induced microclimatic changes, especially on night time humidity levels. During the last decade, dynamic climate procedures, such as temperature integration, have been