

# **2008 Report from Georgia for NCERA-101**

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### **New Facilities and Equipment**

Soil moisture sensors and a wireless datalogger package were purchased from Decagon to monitor substrate water content of greenhouse containers in real-time. By interfacing the base station for the wireless dataloggers with a laptop computer, this new setup allows greenhouse users to monitor substrate water content in real-time over the internet. A server was installed at the research greenhouses to connect wirelessly to laptop computers to allow users to access their data using EchoVNC software. In addition to connecting to the dataloggers with the soil moisture sensors, users also can access the data and control the settings of an automated irrigation system (which can monitor and control the substrate water content in 32 experimental units) and an eight chamber, whole plant gas exchange system.

### **Unique Plant Responses**

The use of an automated, datalogger-controlled irrigation system allowed for quantification of daily water use by bedding plant crops. Daily water use of petunias, vinca, and annual salvia was followed over the entire production cycle, from a seedling plug to marketable size. Independent of species, water use was approximately 15 mL per plant per day early during production and 30 - 40 mL per plant per day late in the production cycle. A single plant used approximately 1 L of water during the five-week period to produce marketable plants from plugs.

Physiological effects of ABA applications on annual salvia were studied. The ABA was applied as a drench to the substrate. Stomatal closure was observed with 30 minutes of applying ABA (at concentrations ranging from 250 to 2000 mg/L) to the substrate, indicating rapid uptake and transport of substrate-applied ABA. Untreated plants used up the available water in the substrate in 1 – 2 days and started wilting on the second day, while ABA-treated plants wilted only after 4 – 6 days. A negative side effect of ABA was leaf abscission, which increased with increasing ABA concentrations.

### **Impact Statements**

The availability of water for agricultural use is under pressure, and more efficient use of the available water is increasingly important. Research at the University of Georgia has quantified daily water use for bedding plants under typical conditions for greenhouses in the Southeast. Daily water use of bedding plants was surprisingly low, ranging from 15 mL per plant per day shortly after transplanting seedlings to 30 - 40 mL per plant per day near the end of the production period. Over the course of a 5-week period, bedding plants (studies have included annual salvia, vinca, and petunia) can be grown with a total of 1 liter of water per plant. Information on daily water use of bedding plants will help growers to fine tune their irrigation practices, which will result in reduced water use, financial savings, and environmental benefits due to the reduction in runoff of water and nutrients from greenhouses.

Plant care in retail settings often is poor, and many plants may become unmarketable because they do

not get enough water and the plants wilt. Research at the University of Georgia has shown that ABA, a plant hormone, can reduce water loss from plants and extend the time to wilting. When ABA solution was applied to the soilless growing medium of *Salvia splendens*, water uptake from the growing medium was greatly reduced and wilting was postponed. High concentrations of ABA also caused leaf abscission, so for it is important to use the appropriate rates. Concentrations of less than 1000 mg/L of ABA can increase the shelf life of salvia without major negative side effects. This will help to maintain plant quality in retail settings, reduce losses due to poor plant quality, and simplify marketing.

## **Published Written Works**

### Refereed Journal Articles

- Burton, A.L., S.V. Pennisi, and M.W. van Iersel. 2007. Morphology and postharvest performance of *Geogenanthus undatus* 'Inca' following application of ancymidol and flurprimidol. *HortScience* 42:544-549
- Frantz, J.M., N.N. Cometti, M.W. van Iersel, and B. Bugbee. 2007. Rethinking acclimation of growth and maintenance respiration of tomato in elevated CO<sub>2</sub>: effects of a sudden change in light at different temperatures. *Journal of Plant Ecology* 31:695-710.
- Montesano, F., and M.W. van Iersel. 2007. Calcium can prevent toxic effects of Na<sup>+</sup> on tomato leaf photosynthesis, but does not restore growth. *Journal of the American Society for Horticultural Science* 132:310-318.
- Nemali, K.S., F. Montesano, S.K. Dove, M.W. van Iersel. 2007. Calibration and performance of moisture sensors in soilless substrates: ECH<sub>2</sub>O and Theta probes. *Scientia Horticulturae* 112:227-334.

### Poster Presentations

- Nemali, K., D. Radcliffe, and M. van Iersel. 2007. Plant available water and pore size distribution in soilless substrates. *HortScience* 42:1003 (poster presentation).

### Popular Articles

- van Iersel, M. and S. Burnett. 2007. Using soil water sensors for efficient irrigation in greenhouses. *Gauging the Green* 1(1): 2, 3, 6.
- Burnett, S. and M. van Iersel. 2007. Better crops, less water. Irrigation automation can make a healthier plant using less water and with less leaching. *Greenhouse Grower* 25(8):66, 68, 70.
- Montesano, F., M. van Iersel, and P. Santamaria. 2007. Così si può controllare la fertilizzazione in serra. (Translated title: This is how it is possible to control fertilization in greenhouses) *Colture Protette. Orticoltura e floricoltura* 36(2):21-30.

### Scientific and Outreach Oral Presentations

- Kang, J.G. M. van Iersel, and S. Burnett. 2007. Irrigation scheduling in greenhouses: Substrate water content effects on growth and physiology of vinca (*Catharanthus roseus*). 2007 Annual meeting of the American Society for Horticultural Science, Scottsdale, AZ.
- Nemali, K. and M. van Iersel. 2007. Physiological responses of tomato to different rates of drought stress. 2007 Annual meeting of the American Society for Horticultural Science, Scottsdale, AZ.

- Ogden, A., G. Krewer, and M.W. van Iersel. 2007. High tunnels trigger earlier flowering and fruit set in organic southern highbush blueberry. Annual meeting of the American Society for Horticultural Science, Scottsdale, AZ.
- van Iersel, M.W. 2007. Canopy gas exchange measurements in controlled environments: Principles and data interpretation. 2007 Agronomy Meetings, New Orleans.
- van Iersel, M.W. 2007. Controlling greenhouse irrigation with soil moisture sensors: practical applications and basic research. Department of Horticulture, University of Kentucky.
- van Iersel, M.W. 2007. Making greenhouse irrigation more efficient: effects of substrate water content on the growth and physiology of vinca. SNA research conference, Atlanta, GA.
- van Iersel, M.W. 2007. Soil moisture sensors for irrigation automation: how much water do plants need? 2007 Farwest Show, Portland, OR.
- van Iersel, M.W. 2007. Efficient greenhouse irrigation: how much water do plants need? GGIA Techshop, SNA annual meeting, Atlanta, GA.