THE STATE UNIVERSITY OF NEW JERSEY
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**REPORT FOR THE NCR-101 MEETING, April 8-11, 2006**

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1. New Facilities Installed

None

2. Cooperative/Interdisciplinary Projects

*Tomato Response to Short-term Temperature Perturbations*

A growth chamber experiment was conducted to evaluate the effects of a two-week temperature perturbation during the flowering stage of tomato plants (*Lycopersicon esculentum Mill.*, cv. Laura) grown in a hydroponic production system. The plants were top-pruned to allow only a single truss to develop to maturity. Tomato seeds were sown in rockwool plugs and transplanted nine days after seeding (DAS) into 150 mm diameter pots filled with perlite. At 45 DAS, when 85% of the plants had developed three flowers, the temperature treatments were implemented and maintained for 14 days. The temperature treatments included the control 23/18°C (day/night, CT), high (HT; 30/25°C), and low (LT; 16/11°C) temperature treatments. A constant 16-hour photoperiod was maintained. Other environmental conditions maintained during the experiment included 70-90% relative humidity, 350-400 μmol $m^{-2}$ $s^{-1}$ PAR, and 950-1,050 μmol $mol^{-1}$ $CO_2$. Tomato plants were harvested at two different stages: breaker (B; when 25% of the fruit exhibited a red/orange tint), and breaker plus six days (B+6). All harvestable fruits were used for mass and quality measurements, including moisture content, soluble sugar content, pH, acidity, Bostwick consistency, color indices, and firmness. Fruit mass for the B and B+6 harvest stages of the HT treatment was significantly lower compared to the LT and CT treatments that were not significantly different from each other. The HT treatment plants exhibited flower abortion resulting in significantly lower total fruit number compared to LT and CT treatment plants. Moreover, a significantly higher number of fruits of the HT treatment experienced severe cracking compared to the CT and LT treatment fruits. However, HT treatment fruits were harvested significantly earlier than either LT or CT treatment fruits. Soluble sugar content of HT treatment fruits was significantly higher than LT and CT treatment fruits. The pH was lowest and acidity highest for both the B and B+6 stages of the HT treatment fruits. The HT treatment resulted in the lowest Bostwick consistency. The LT treatment resulted in the firmest fruits.

*Tomato Production in High Tunnels*

The impact of a manually operated energy curtain on the recorded inside soil and air temperatures and daily light integrals during early season high tunnel tomato (*Lycopersicon esculentum*) trials was evaluated. Data was collected from late March through mid May for two New Jersey locations and for two growing seasons (2004 and 2005). The data revealed that for early season tomato production in high tunnels located in central and south Jersey:

- The use of an energy curtain inside a high tunnel increased the inside nighttime air temperature on average by 1.4°C (or 13%) compared to a tunnel without a curtain. A tunnel without an energy curtain maintained an inside nighttime air temperature that was 0.8°C (or 8%) higher compared to the outside nighttime air temperature.
- The use of an energy curtain inside a high tunnel increased the inside nighttime soil temperature on average by 0.5°C (or 4%) compared to a tunnel without a curtain. A tunnel without an energy curtain maintained an inside nighttime soil temperature that was 6.7°C (or 54%) higher compared to the nighttime outside soil temperature.
- The use of an energy curtain inside a high tunnel decreased the summed inside light level on average by approximately 100 mol $m^{-2}$ (or 5%) compared to a tunnel without a curtain. A tunnel without an energy curtain maintained an inside accumulated light level that was approximately 440 mol $m^{-2}$ (or 24%) lower compared to the outside accumulated light level.

3. Committees and Sub-Committees Served

International Committee for Controlled Environment Guidelines: A.J. Both, Chair

NE-1017 Developing and Integrating Components for Commercial Greenhouse Production: A.J. Both, Incoming Secretary (2006)

4a. Recent Publications

Both, A.J., L.S. Logendra, J. Cavazzoni, T. Gianfagna, T.C. Lee, and H.W. Janes. Effects of a two-week temperature perturbation during flowering of tomato (*Lycopersicon esculentum Mill.*). Habitation 10(3/4):131.

Both, A.J., E. Reiss, D.R. Mears, and W. Fang. 2005. Designing environmental control for greenhouses: Orchid production as example. Acta Horticulturae 691(2):807-813.

Fleisher, D.H., L.S. Logendra, C. Moraru, A.J. Both, J. Cavazzoni, T. Gianfagna, T.C. Lee, and H. Janes. 2006. Effect of temperature perturbations on tomato (*Lycopersicon esculentum* Mill.) quality and production scheduling. Journal of Horticultural Science and Biotechnology 81(1):125-131.

Reiss, E., A.J. Both, and D.R. Mears. 2005. Comparing greenhouse floor heating designs using CFD. ASAE paper No. 05-4136. ASAE, 2950 Niles Road, St. Joseph, MI 49085-9659, USA. 19 pp.

Reiss, E. 2006. Modeling greenhouse floor heating using computational fluid dynamics. M.S. Thesis. Rutgers University Libraries.

Sager, J.C., J.H. Norikane, A.J. Both, and T.W. Tibbitts. 2005. Quality assurance for environment of plant growth facilities. ASAE paper No. 05-4137. ASAE, 2950 Niles Road, St. Joseph, MI 49085-9659, USA. 11 pp.

## 4b. Publications Submitted/In Press

Lefsrud, M., D. Kopsell, R. Augé, and A.J. Both. 2006. Biomass Production and Pigment Accumulation in Kale Grown Under Increasing Photoperiods. Accepted for publication in HortScience.

Mathieu J., R. Linker, L. Levine, L. Albright, A.J. Both, R. Spanswick, R. Wheeler, E. Wheeler, D. deVilliers, R. Langhans. 2005. Evaluation of the NiCoLet Model for Simulation of Short-Term Hydroponic Lettuce Growth and Nitrate Uptake. Submitted to Biosystems Engineering.

Goudarzi, S., A.J. Both, J. Cavazzoni, and A. Kusnecov. 2006. Dynamic modeling of crew performance. In Press. Journal of Human Performance in Extreme Environments.

## 5. Internet Site

http://aesop.rutgers.edu/~horteng

## 6. Other

Cook College has a new name: School of Environmental and Biological Sciences.