THE STATE UNIVERSITY OF NEW JERSEY
RUTGERS

REPORT FOR THE NCR-101 MEETING, March 12-15, 2005

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1. New Facilities Installed

   None

2. Cooperative/Interdisciplinary Projects

   Tomato Response to Short-term Temperature Perturbations

   Two-week changes in air temperature imposed after fruit-set were used to control single-truss tomato production scheduling and improve quality of vine-ripened fruit. Experiments were conducted with hydroponically grown tomato (Lycopersicon esculentum Mill., cv. Laura). Air temperature was altered from control values of 23/18°C for a two-week period starting 10 days post fruit-set. Plants were returned to control temperature and fruits were harvested from the cluster at three ripening stages, breaker (25% of the fruit skin acquired a red tint), breaker plus three days, and breaker plus six days. A ± 5°C (28/23°C and 18/13°C) temperature perturbation was used for two experiments and a ± 7°C (30/25°C and 16/11°C) was used in a third experiment. An increase in harvest window, reduction in days to harvest (between 5.5 and 7.2 days), and a reduction in fruit fresh weight at latter stages of vine-ripening was observed for high temperature treatments. Low temperature increased fruit fresh weight compared to the control, and the 16/11°C treatment delayed days to harvest by 2.7 days. Color indices, soluble solids, acidity, viscosity, and lycopene content at each vine-ripened stage were significantly different between temperature treatments. The temperature treatments altered the rate at which changes occurred in the external appearance of fruit (color) and internal characteristics. Results can be used for improving environmental control and management strategies for tomato growers.

   Tomato Production in High Tunnels

   The second year of tomato trials in the Rutgers University high tunnels was a mixed success. An early season trial with the commercial varieties SunBright and SunShine was started in late March at both the New Brunswick and Centerton locations. The trial at Centerton was completed at the end of August, but the trial in New Brunswick was lost due to a severe outbreak of white mold (caused by the fungus *Sclerotinia sclerotiorum*). As a result, the New Brunswick tunnels were available in early August for a fall experiment. This fall crop using the same commercial varieties was grown till the middle of November when unheated high tunnel production was no longer possible as a result of low outside temperatures. Preliminary conclusions are:

   - High tunnels with mulched beds provide significantly higher soil and air temperatures
   - Motorized roll-up sides reduce the labor requirement, but in our trials had little effect on average daily temperatures, and significantly increased the construction cost
   - Little difference in soil temperatures was observed under differently colored mulches
   - Tunnel orientation did not significantly impact average light transmission (that turned out to be approximately 75%)
   - The NJ growing season is too short for two consecutive full-term high tunnel tomato crops

3. Workshops/Symposia

   The annual two-day workshop titled “Design of Greenhouse Systems” was organized in January 2004, 2005. The annual meeting of the regional project NE-1017 (Developing and Integrating Components for Commercial Greenhouse Production Systems) was organized at Rutgers in June in conjunction with the ASAE Historic Landmark Dedication of the first Air-Inflated Double-Layer Polyethylene Greenhouse (developed by Professor Emeritus William J. Roberts).

4. Committees and Sub-Committees Served

   International Committee for Controlled Environment Guidelines: A.J. Both, Chair
   SE-303 Committee on Environment of Plant Structures, ASAE: A.J. Both, Chair (2004)

5a. Recent Publications

Both, A.J. and J. Faust. 2004. Light transmission in greenhouse design and coverings. Chapter 4. In ‘Lighting Up Profits, Understanding Greenhouse Lighting’, P. Fisher and E. Runkle, eds. Published by Meister Media Worldwide, Willoughby, OH. pp. 33-38.

Both, A.J. 2004. Carbon dioxide enrichment in greenhouses. Chapter 7. In 'Lighting Up Profits, Understanding Greenhouse Lighting', P. Fisher and E. Runkle, eds. Published by Meister Media Worldwide, Willoughby, OH. pp. 47-50.

Both, A.J. 2004. Rutgers high tunnel research. Proceedings of the 49th New Jersey Annual Vegetable Growers' Association Meeting, Borgata Hotel Casino and Spa, Atlantic City, NJ. pp. 83-90.

Both, A.J. 2004. Greenhouse environment control. Proceedings of the 49th New Jersey Annual Vegetable Growers' Association Meeting, Borgata Hotel Casino and Spa, Atlantic City, NJ. pp. 91-95.

Both, A.J. 2004. Greenhouse becomes 43rd ASAE historic landmark. Resource magazine (ASAE). September issue. pp 19.

Both, A.J. 2004. Supplemental lighting. Greenhouse Product News 14(12):48-53 (reprint from OFA Bulletin July/August 2003).

Both, A.J. 2004. Insect screening. American Vegetable Grower. June issue. p. 28.

Both, A.J. 2004. Comparing greenhouse coverings. American Vegetable Grower. June issue. pp. 23-24

Both, A.J. 2004. Greenhouse temperature management. Greenhouse Management and Production (GMPRO). April issue. pp. 38-42.

Cavazzoni, J. 2004. Using explanatory models to derive simple tools for Advanced Life Support system studies - Crop modeling. Advances in Space Research 34(7):1528-1538.

Fisher, P. and A.J. Both. 2004. Supplemental lighting technology and costs. Chapter 6. In 'Lighting Up Profits, Understanding Greenhouse Lighting', P. Fisher and E. Runkle, eds. Published by Meister Media Worldwide, Willoughby, OH. pp. 43-46.

Fisher, P., A.J. Both, R. Heins, and A. Enfield. 2004. Lighting plugs and liners, Chapter 9. In 'Lighting Up Profits, Understanding Greenhouse Lighting', P. Fisher and E. Runkle, eds. Published by Meister Media Worldwide, Willoughby, OH. pp. 57-61.

Fisher, P. and A.J. Both. 2004. Photoperiod control through technology options and their costs. Chapter 8. In 'Lighting Up Profits, Understanding Greenhouse Lighting', P. Fisher and E. Runkle, eds. Published by Meister Media Worldwide, Willoughby, OH. pp. 51-56.

Goudarzi, S. and A.J. Both. 2004. Accounting for performance decrements in crew time calculations for space missions. Presented at the 34th International Conference on Environmental Systems, July 19-22, Colorado Springs, Colorado. SAE Technical Paper No. 2004-ICES-215.

Reiss, E., A.J. Both, and D.R. Mears. 2004. Greenhouse floor heating. ASAE paper No. 04-4040. ASAE, 2950 Niles Road, St. Joseph, MI 49085-9659, USA. 13 pp.

Ross, D.S. and A.J. Both. 2004. Inventor of air-inflated double-layer polyethylene greenhouse honored. Mid-Atlantic Grower 6(10) August Issue. pp. 6-7.

5b. Publications Submitted

Armitage, A.M., M.P. Bridgen, A.J. Both, D. Hamrick, R.D. Heins, W.B. Miller, G.L. Staby, T.C. Weiler, and W.R. Woodson. 2004. Views of floriculture in the last 25 years. Submitted to Journal of the American Society for Horticultural Science.

Both, A.J., E. Reiss, D.R. Mears, and W. Fang. 2004. Environmental control – System and strategy design tool. Submitted to Acta Horticulturae.

Fleisher, D.H., L.S. Logendra, C. Moraru, A.J. Both, J. Cavazzoni, T. Gianfagna, T.C. Lee, and H. Janes. 2005. Effect of temperature perturbations on tomato quality and production scheduling. Submitted to the Journal of Horticultural Science and Biotechnology.

Goudarzi, S., A.J. Both, J. Cavazzoni, and A. Kusnecov. 2004. Dynamic modeling of crew performance. Accepted for publication in the Journal of Human Performance in Extreme Environments.

Janes, H., J. Cavazzoni, G. Alagappan, D. Specca, J. Willis. 2005. Landfill Gas-to-Energy: A Demonstration Controlled Environment Agriculture System, HortScience 40(2). In Press.

Reiss, E., A.J. Both, S. Garrison, W. Kline, and J. Sudal. 2004. Season extension for tomato production using high tunnels. Submitted to Acta Horticulturae.

6. Internet Site

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

7. Other

Since the 2004 annual meeting, where the International Committee for Controlled Environment Guidelines presented the brochure titled "Minimum Guidelines for Measuring and Reporting Environmental Parameters for Experiments on Plants in Growth Rooms and Chambers", the committee developed and distributed the "Minimum Guidelines Poster" (12 by 17 inches; vertical format) summarizing the information contained in the brochure. In addition, a single large size poster (3 by 4 feet; vertical format) containing the same information was developed for use by the membership as a display at scientific meetings.