NCERA-101: Committee on Controlled Environment Technology and Use
2007 Station Report

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New Facilities and Equipment

Michigan State University now has 141 growth chambers in operation. These range in age from brand new to over 30 years old (however, nearly all of the latter have been rebuilt). We expect delivery of six additional chambers from Biochambers in March 2008, which should help address the backlog of requests for chamber space. Seventeen more chambers are expected to arrive in October 2008. These new chambers vary in their capabilities; several are for low temperature studies, others are designed to deliver high light or allow CO_2 manipulation. However, most are 20 ft^2 or 40 ft^2 (two shelf) reach-in chambers. We are also implementing remote access for many of the newer chambers. More information is available on the MSU Growth Chamber Facility website at: http://growthchamber.prl.msu.edu/all/home.php.

Accomplishment Summaries

In 2007, Michigan State University expanded and formally released the Greenhouse Energy Cost Reduction Strategies website (www.hrt.msu.edu/Energy/Notebook.htm). This website includes pertinent research-based information on how greenhouse growers in temperate climates can consume less energy and improve production efficiency. This resource includes documents on greenhouse lighting (15), temperature and scheduling (12), energy-saving technologies (20), alternative fuels (18), and energy grant and loan opportunities (9). Most of these documents are in printable pdf format and first appeared in greenhouse trade magazines.

Researchers at Michigan State University evaluated the effectiveness of a commercial stationary high-pressure sodium (HPS) lamp with an oscillating parabolic reflector. The reflector provides an intermittent beam of light over a relatively large greenhouse growing area, which can potentially provide an energy-efficient strategy to create artificial long days. Several floriculture crops that require long days for flowering were grown at lateral distances up to 13 meters (42 feet) from the lamp. As the lateral distance from the cyclic HPS lamp increased from 1 to 13 m, the maximum light intensity decreased exponentially from 20.9 to 0.4 $\mu mol \cdot m^{-2} \cdot s^{-1}$. In general, the cyclic HPS lamp was effective at providing a long day, although for some crops, flowering was progressively delayed as distance from the lamp increased.

Impact Statements

Phalaenopsis and related orchid genera are among the most popular and widely grown potted flowering plants in the United States, Europe, and Asia. We previously learned that the day temperature primarily regulates flowering of mature plants. In 2007, we exposed plants to different durations of high temperatures during the day to identify the minimum exposure to inhibit flowering. Four hours at 29 ºC (84 ºF) did not inhibit flowering of any hybrid studied, but 8 or 12 hours at this temperature prevented flowering of some hybrids. Other hybrids flowered

even when exposed to 8 or 12 hours of high temperature but flowering was delayed by 4 to 6 weeks. Using a high day temperature and cooler night temperature could be used to prevent flowering when desired, such as during the vegetative phase. This practice could reduce heating costs for commercial orchid growers.

Researchers at Michigan State University have conducted "limited inductive photoperiod" experiments to determine: (1) when in development 12 bedding plant species become receptive to the flower-inducing photoperiod, and (2) how long each species must be grown under the appropriate photoperiod for floral induction to occur. Our results show that properly managing photoperiod during the seedling stage can reduce crop production time considerably for many crops. For example, *Celosia argentea* 'Gloria Scarlet', *Cosmos bipinnatus* 'Sonata Pink' and *Tagetes tenuifolia* 'Tangerine Gem', all short-day plants, could be induced to flower following exposure to as few as five short days when the first true leaves were expanded. This resulted in a 35% to 40% reduction in production time for each species compared to growing under constant long days during the seedling stage, which is standard industry practice.

Published Written Works (*denotes peer-reviewed scientific manuscript)

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Faust, J.E., J.K. Rapaka, J.M. Dole, and E.S. Runkle. 2007. Cold-chain management. Greenhouse Grower 25(11):14-20.

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*Rapaka, V.K., J.E. Faust, J. Dole, and E.S. Runkle. 2007. Diurnal carbohydrate dynamics affect postharvest ethylene responsiveness in portulaca (*Portulaca grandiflora* 'Yubi Deep Rose') unrooted cuttings. Postharvest Biol. Technol. 44:293-299.
*Rapaka, V.K., J.E. Faust, J. Dole, and E.S. Runkle. 2007. Effect of time of harvest on postharvest leaf abscission in lantana (*Lantana camara* L. 'Dallas Red') unrooted cuttings. HortScience 42:304-308.
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Scientific and Outreach Oral Presentations

Becker, K., A. Hammer, J. Latimer, E. Runkle, and B. Whipker. 2007. Plant Growth Management Symposium. OFA Short Course, Columbus, OH.

Blanchard, M. and E. Runkle. 2007. Surviving the Energy Crisis Part 2: Efficient Production in an Energy-Lean Environment. OFA Short Course, Columbus, OH.

Frantz, J., E. Runkle, M. Blanchard, J. Locke, and C. Krause. 2007. Virtual grower: Estimating greenhouse energy costs and plant growth using new computer software. HortScience 42(4):1018.

Padhye, S., C. Whitman, E. Runkle, and A. Cameron. 2007. Flowering responses of five *Gaillardia* cultivars to vernalization, photoperiod, and daily light integral. HortScience 42(4):948.

Runkle, E. 2007. MSU Floriculture Research Update. Michigan Plant Growers Co-op meeting, Grand Rapids, MI.

Runkle, E. 2007. Improving the Energy Efficiency of Greenhouse Crop Production in Michigan. Michigan Greenhouse Growers Expo, Lansing, MI.

Runkle, E. 2007. Top 10 Greenhouse Energy Saving Strategies. Indiana Flower Growers Conference. West Lafayette, IN.

Runkle, E. 2007. The Latest in PGR Chemicals and Applications. Indiana Flower Growers Conference. West Lafayette, IN.

Runkle, E. 2007. Growing Strategies and Technology Options to Reduce Greenhouse Energy Consumption. Getting Green: Sustainable Energy Use for the Green Industry Conference. Timonium, MD.

Runkle, E. 2007. Gadgets for Tracking Light and Temperature. GrowerTalks' Greenhouse Experience, Cleveland, OH.

Runkle, E. 2007. Managing Light in the Greenhouse. GrowerTalks' Greenhouse Experience, Cleveland, OH.

Runkle, E. 2007. Greenhouse Temperature Management. GrowerTalks' Greenhouse Experience, Cleveland, OH.

Warner, R.M. 2007. Impact of Light and Plug Size on Bedding Plant Scheduling. Michigan Greenhouse Growers Expo, Lansing, MI

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