Michigan State University 2015 Station Report
NCERA-101: Committee on Controlled Environment Technology & Use

Erik Runkle and Ryan Warner
Department of Horticulture, East Lansing, MI 48824

Personnel

- Dr. Roberto Lopez was hired as an assistant professor in the production of specialty crops grown in controlled environments with a 45% research, 30% teaching, and 25% extension appointment. He's been on the faculty at Purdue University and will join the faculty in the Department of Horticulture at MSU in March, 2016.

New Equipment and Facilities

- Planning is underway for the Controlled-Environment Lighting Laboratory (CELL), an indoor research facility in which sole-source LED lighting can be manipulated to grow specialty crops (including leafy greens, herbs, and ornamentals) with desired quality characteristics. Located on the first floor of the Plant & Soil Science Building, it will feature interior windows so that students and the public can view experiments in progress. The facility is expected to be operational at the end of 2016.

Accomplishment Summaries

- M.S. student Brian Poel and Erik Runkle grew seedlings in greenhouses under four different Philips toplighting LED modules or under high-pressure sodium lamps at the same light intensity and temperature. Generally, plant quality attributes (e.g., stem length, leaf area, and weight) were similar, suggesting that light quality has relatively little effect on plant growth when supplementing sunlight.
- Ph.D. student Yujin Park evaluated growth of ornamental seedlings under blue light and different intensities of red and far-red radiation in a refrigerated growth chamber. The inclusion of far red in the radiation spectrum increased leaf expansion, resulting in an increase in whole-plant photosynthesis.
- Planning continued for the 8th International Symposium on Light in Horticulture, held in East Lansing, MI from May 22 to 26, 2016. This symposium is held in coordination with the International Society for Horticultural Science and is sponsored by 25 lighting, horticulture, or agricultural companies including several NCERA-101 industry members. For more information, visit www.lightsym16.com.
- M.S. student QiuXia Chen and Ryan Warner evaluated a *Petunia axillaris* × *P. exserta* recombinant inbred line population for numerous crop growth and quality traits under a range of temperatures. Quantitative trait loci (QTL) were identified for all traits. Some of these QTL were robust across the temperature range while others were temperature specific.

Impact Statements

- Although there were few growth differences under greenhouse supplemental lighting from LEDs or high-pressure sodium lamps, the LEDs consumed less than half the amount

of electricity. Thus, the potential energy savings can be substantial for commercial greenhouse operations that transition to LEDs.

- Preliminary research indicates that inclusion of far-red radiation in sole-source lighting can increase quality attributes in some crops by increasing leaf size, which subsequently increases radiation capture and plant biomass. In some crops, the inclusion of far red can also accelerate subsequent flowering. Both of these crop responses can increase crop value and thus, the price growers receive compared with greenhouse-grown plants.
- Identifying QTL for important crop timing and quality traits aids discovery of genes underlying those traits, which will facilitate breeding efforts to develop new varieties that can be produced with reduced energy and labor inputs.

Published Written Works (*denotes peer reviewed)

*Evans, JM, Vallejo, VA, Beaudry RM and Warner RM. 2015. Daily light integral influences steviol glycoside biosynthesis and relative abundance of specific glycosides in stevia. HortScience 50:1479-1485.

*Guo, Y, Wiegert-Rininger, KE, Vallejo VA, Barry CS, Warner RM. 2015. Transcriptome-enabled marker discovery and mapping of plastochron-related genes in Petunia spp. BMC Genomics 16:726.

*Kim, Y.J., D.J. Yu, H. Rho, E.S. Runkle, H.J. Lee, and K.S. Kim. 2015. Photosynthetic changes in Cymbidium orchids grown under different intensities of night interruption lighting. Sci. Hort. 186:124-128.

*Meng, Q. and E.S. Runkle. 2015. Low-intensity blue light in night-interruption lighting does not influence flowering of herbaceous ornamentals. Sci. Hort. 186:230-238.

*Meng, Q. and E.S. Runkle. 2015. The role of blue light in night-interruption lighting of petunia. Acta Hort. 1107:101-105.

*Mitchell, C.A., M.P. Dzakovich, C. Gomez, R. Lopez, J.F. Burr, R. Hernández, C. Kubota, C.J. Currey, Q. Meng, E.S. Runkle, C.M. Bourget, R.C. Morrow, and A.J. Both. 2015. Light-emitting diodes in horticulture, p. 1-88. In: J. Janick (ed.). Horticultural Reviews vol. 43. John Wiley & Sons, Hoboken, NJ.

*Newton, L.A. and E.S. Runkle. 2015. Effects of benzyladenine on vegetative growth and flowering of potted Miltoniopsis orchids. Acta Hort. 1078:121-127.

Runkle, E. 2015. Environment and PGR interactions. Greenhouse Product News 25(12):74.

Runkle, E. 2015. Keys to successful seedling production. Greenhouse Product News 25(11):50.

Runkle, E. 2015. Lighting metrics… And what matters. Greenhouse Product News 25(10):62.

Runkle, E. 2015. Photoperiodic vs. photosynthetic lighting. Greenhouse Product News 25(9):74.

Runkle, E. 2015. Dealing with nonuniformity. Greenhouse Product News 25(8):62.

Runkle, E. 2015. Interactions of light, CO2 and temperature on photosynthesis. Greenhouse Product News 25(6):54.

Runkle, E. 2015. Crops with relatively low “optimum” temperatures. Greenhouse Product News 25(5):50.

Runkle, E. 2015. Trending: PGR sprenches. Greenhouse Product News 25(4):42.

Runkle, E. 2015. Light wavebands & their effects on plants. Greenhouse Product News 25(3):42.

Runkle, E. 2015. The PGR ancymidol. Greenhouse Product News 25(2):42.

Runkle, E. 2015. Dealing with the cold. Greenhouse Product News 25(1):50.

Runkle, E. and R. Heins. 2015. Boom lighting. Greenhouse Product News 25(7):66.

*Vaid, T. and E.S. Runkle. 2015. Low temperature diminishes the photoperiodic flowering response of three petunia cultivars. Acta Hort. 1104:185-190.

*Wollaeger, H.M and E.S. Runkle. 2015. Growth and acclimation of impatiens, salvia, petunia, and tomato seedlings to blue and red light. HortScience 50:522-529.

Websites Managed

8th ISHS International Symposium on Light in Horticulture, http://www.lightsym16.com

Developing LED lighting technologies and practices for sustainable specialty-crop production, http://leds.hrt.msu.edu

Michigan Garden Plant Tour, http://planttour.hrt.msu.edu

MSU Floriculture Production, http://www.flor.hrt.msu.edu