

NCERA-101 Station Report
Cornell University
Neil Mattson, nsm47@cornell.edu
Louis D. Albright, albright@cornell.edu
Davis S. de Villiers, dsd5@cornell.edu
Timothy J. Shelford, tjs47@cornell.edu
Tyler S. Anderson, tsa46@cornell.edu

1. New Facilities and Equipment:

- Shelford, de Villiers, and Anderson constructed six small deep water culture ponds under a ca. 400 sf HPS array to study root-zone temperature response of baby leaf spinach in floating bed hydroponics. Each pond is connected to a chilled water source; the water temperature of each pond can be independently controlled.
- Anderson constructed an aquaponic research system in which a ca. 1,000 gallon fish tank currently stocked with koi is connected to 6 deep water culture ponds used to grow lettuce in floating bed hydroponics.

2. Unique Plant Responses:

- Silicon has been investigated by Mattson as a fertilizer supplement to increase heat tolerance of petunia 'Mitchell Diploid'. Silicon treatment led to visual improvement of petunias exposed to 40 °C for three days. Si supplementation partially ameliorated reductions in photosynthesis and chlorophyll fluorescence in response to heat stress.

3. Accomplishment Summaries:

- Cornell's Controlled Environment Agriculture (CEA) group trained three interns during summer 2013. Summer interns received instruction on several CEA topics, developed and conducted independent research projects on hydroponic crops, and took field trips to commercial greenhouse facilities.
- Greenhouse water recirculation can lead to high salts accumulation. We have addressed short term needs by developing salt management guidelines (i.e. threshold levels) for several common floriculture species. Results of this effort were published as a two article series in Greenhouse Grower Magazine and in HortTechnology. We are also using molecular techniques to learn more about processes that plants use to mitigate salt toxicity. Using petunia as a model floriculture species we conducted high throughput RNA sequencing to determine transcriptome level responses to NaCl. This research will identify candidate genes/markers for selecting petunia varieties for tolerance to high salts.
- While closed irrigation systems limit water pollution, most New York State greenhouse producers have not adopted these systems, in part, due to expensive costs of installation. Controlled release fertilizers (CRF) may represent a tool to reduce nutrient leaching in open irrigation systems. We compared growth of bedding plants, poinsettias, and garden mums in response to different rates of CRF and conventional liquid fertilizers (LF). We found that CRF adoption at the label medium to high rate led to plant growth equal to conventional LF in all but the most vigorous plants. CRFs applied at the medium to high rate led to a reduction in nitrogen and phosphorus runoff by five- to ten-fold compared with LF.

4. Impact Statements:

- Four years of experiments have been conducted to compare the production of spring bedding plants and hanging baskets in unheated high-tunnels as compared to heated greenhouse environments. Several cold tolerant bedding plant crops (such as pansy, petunia, snapdragon, and dianthus) seem to be well suited to this production method, which yields substantial savings in energy and capital expenditures as compared to traditional heated greenhouse production.

- A subject of on-going research is strategies to fertilize vegetable and herb transplants organically. A comparison of several different organic substrates was conducted both on-campus and by 14 grower collaborators. Results, which have been shared with 1,000+ growers by presentations and newsletter articles are providing crucial information to help meet the needs of the expanding market for organic plants and produce in New York State and the Northeast.

5. Published Written Works:

Scientific

- Li, Y., J. Qin, N.S. Mattson, and Y. Ao. 2013. Effect of potassium application on celery growth and cation uptake under different calcium and magnesium levels in substrate culture. *Scientia Horticulturae*. 158:33-38.
- Mattson, N.S., E.M. Lamb, B. Eshenaur and J. Sanderson. 2013. IPM In-Depth: A New York model for hands-on interactive greenhouse workshops. *HortTechnology*. 23(6):796-799.
- Paparozzi, E., N. Mattson, M. Grossman, S. Burnett and R. Lopez. 2013. Creative thinking, creative funding: research, extension and teaching programs and consortiums – the 2013 National Floriculture Forum. *HortTechnology*. 23(6):794-795.
- Reid, J.E., Klotzbach, K.E., Hoover, N.R. and Mattson, N.S. 2013. Hanging baskets of petunias increase revenue in high tunnel tomato production. ISHS Symposium on High Tunnel Horticultural Crop Production. State College, PA, October 16-19. *Acta Horticulturae*. 987:67-71.

Popular (Trade) Press

- Albright, L.D. 2013. Peri-urban horizontal greenhouses. *ASABE Resource Magazine* 20(2):6.
- Beeks, S. and N. Mattson. 2013. Vermicompost is putting worms to work. *Greenhouse Grower Magazine*. 31(7):38-44.
- Mattson, N., B. Krug and R. Lopez. Promising trends for the future of floriculture education and extension. *Greenhouse Grower Magazine*. 31:14(94-95).
- Mattson, N. 2013. Stress is good for plants. *Greenhouse Grower Magazine*. 31(9):57-58.
- Miller, W. Mattson, N., R. Lopez, C. Currey, K. Clemens, M. Olrich and E. Runkle. 2013. A new height control possibility for daffodils and hyacinths. *Greenhouse Product News*. 23(3):20-23.
- Runkle, E., C. Currey, K. Clemens, R. Lopez, W. Miller and N. Mattson. 2013. Ethephon drenches on bedding plants. 2013. *Greenhouse Product News*. 23(4):14-18.

Other extension publications

- Lamb, E., B. Eshenaur, N.S. Mattson, J.P. Sanderson. 2013. Practical suggestions for managing fungus gnats in the greenhouse.
http://www.nysipm.cornell.edu/factsheets/n_gh/fungus_gnat.pdf
- Mattson, N.S. and S.A. Beeks. 2013. Extensive soil mix studies for greenhouse production of seedlings and transplants. New England Vegetable and Fruit Conference proceedings. December 17-19, Manchester, NH. 205-207.

6. Other relevant activities or information: