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2011 Station Report to the NCERA-101 Committee

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1. **Impact Nugget**:
- Developed and licensed two organic greenhouse vegetable growing substrates to a commercial company.
- Developed a weed control disk for container plant production. Weeds were 100% under control and shrubs grew >50% faster in pots with the disk compared to pots without.
- Licensed Guelph Blue Box Chamber Technology

2. **New Facilities and Equipment**.
Psychrometers
Data Logger Controller CR7
UV Vis Spectrophotometer
Weather stations; solar panels
Gas sensors
Nitrite Oxide Monitor, NO2 Converter

3. Unique Plant Responses.
- hydroponic greenhouse tomato (plant) growth is improved with the application of aqueous ozone directly to the root zone (via drip irrigation) at concentrations up to 3 mg/L applied daily for 5 minutes (duration of irrigation cycle)
- low frequency (of application), high concentration aqueous ozone solutions are tolerated by cucumber and tomato grown in rockwool hydroponic culture
- root pathogen levels are suppressed by root application of aqueous ozone
- Unique Pollinator Response: Foraging and flight capabilities of bumblebees (*Bombus impatiens*) were studied at reduced atmospheric pressures. At total pressures of 50 kPa or more, foraging and flying were similar to controls. Below 50 kPa, bees spent more time walking or stationary.

4. Accomplishment Summaries.
Developed two environmentally friendly growing substrates for greenhouse potted flower production. Plants performed as well or better when grown in these substrates comparing to plants in commercially available growing substrate.
- Developed 4 growing substrates using locally available composted organic wastes for container shrub productions. Plants performed as well or better when grown in these substrates comparing to plants in commercially available growing substrate.
- Currently entering final development phase of a low cost gaseous ammonia sensor that will allow for a more comprehensive agricultural ammonia monitoring program. The low cost and ease of deployment will allow for a wider distribution of monitoring sites

which will improve current temporal and spatial models of ammonia flux to the environment.

5. Impact Statements

Significant progress made towards the development of agricultural ammonia monitoring systems that will greatly improve the spatial (and temporal) resolution of current ecosystem nitrogen loading models. Through a major reduction in size and complexity, these sensors will be cost effective under wide spread deployment scenarios. Improved monitoring is key to improved regulation, remediation and reclamation.

6. Published Written Works.

Scientific Publications

Zheng Y, Cayanan DF Dixon M. 2010. Optimum Feeding Nutrient Solution Concentration for Greenhouse Potted Miniature Rose Production in a Recirculating Subirrigation System. HortScience. 45: 1738-1383.

Tian XL, Dixon M and Zheng Y. 2010. First Report of *Hiemalis Begonias* Wilt Disease Caused by *Fusarium* 1 *foetens* in Canada. Plant Disease 94: 1261.

Surrage VA, Lafrenière C, Dixon M and Zheng Y. 2010. Growth Substrates for Organic Greenhouse Tomato Production. HortScience. 45: 1510-1515.

Zheng Y, Linping Wang, Diane Feliciano Cayanan and Mike Dixon. 2010. Greenhouse Cucumber Growth and Yield Response to Copper Application. HortScience. 45: 771 – 774.

Zheng Y**,** Ferguson G and Dixon M. 2011. Organic Greenhouse Vegetable Production in Canada: Challenges and Opportunities. *Acta Horticulturea* (In press).

Lafrenière C, Surrage V, Dixon M and Zheng Y. 2011. Evaluation of zeolite as a component in organic growing substrates for tomato transplant troduction. *Acta Horticulturea* (In press).

Stutte, G., N.C. Yorio, S.L. Edney, J.T. Richards, M. Stasiak, M. Dixon, R.M. Wheeler. (2011). Effect of Reduced Atmospheric Pressure on Yield and Quality of Two Lettuce Cultivars. Journal of the American Society for Horticultural Science. (InPress).

Graham, T. G., P. Zhang, M. Dixon. (2011). Aqueous ozone in the root zone: friend or foe? Journal of Horticulture and Forestry. 3(2):58-62.

Graham, T., P., Zhang, E. Woyzbun, M.A. Dixon. (2011). Response of hydroponic tomato to daily applications of aqueous ozone via drip irrigation. *Scientia Horticulturae*. In press.

Llewellyn, D., Dixon, M. (2011). Can plants really improve indoor air quality? Comprehensive Biotechnology, 2nd edition. (In Press).

Wheeler, R.M., Wehkamp, C., Stasiak, M., Dixon, M. and Rygalov, V. (2011). Plants survive rapid decompression: Implications for bioregenerative life support. Advances in Space Research. 47: 1600-1607.

Websites developed

www.ces.uoguelph.ca/greenroof/

Others

Kennedy, Celia. 2010. Adaptive approaches to sub-irrigation of potted *Gerbera jamesonii* and *Chrysanthemum morifolium* in greenhouse production. MSc. Thesis. University of Guelph.

Cayanan. Donny F. 2009. Improving greenhouse irrigation using a wireless soil moisture sensor-based automated irrigation system. MSc. Thesis. University of Guelph.

7. Scientific and Outreach Oral Presentations. Include workshops, colloquia, conferences, symposia, and industry meetings in which you presented and/or organized. See below for formatting.

Zheng Y. and Dixon, M. 2011. Sustainable nursery production and green roof technology. Landscape Ontario Growers' Group 2010 Short Course. Feb. 9, 2011. Royal Botanic Gardens, Burlington, On.

Kennedy C, Zheng Y and Dixon M. 2010. Response of potted gerberas to irrigation regimes. Canadian Greenhouse Conference. Toronto, Ontario. Oct. 6-7, 2010 (Invited talk).

Zheng Y and Dixon, M. 2010. Are there sweet profits growing bitter melon. Canadian Greenhouse Conference. Toronto, Ontario. Oct. 6-7, 2010 (Invited talk).

Zheng Y, D Cayana, C Kennedy and M Dixon. 2010. Wireless sensor technology and potted ornamental plant irrigation. 28th International Horticulture Congress. Aug. 22-28, 2010. Lisbon, Portugal. Oral presentation.

Youbin Zheng. 2010. The Application of Horticultural Technologies in Urban Agriculture Practices. Living Plants, Liveable Communities: Exploring Sustainable Horticulture for the 21st Century. Royal Botanic Garden, February 16th through 19th, 2010.

Claudia Lafrenière, Victoria Surrage, Mike Dixon, and Youbin Zheng. 2010. How to produce organic tomato transplants. Ontario Fruit and Vegetable Convention, Feb. 24-25, 2010. Brock University, St. Catharines, On.

Zheng, Y and Dixon, M. 2010. Fertilization, Irrigation and Nursery Production. Landscape Ontario Growers' Group 2010 Short Course. Feb. 10, 2010. Royal Botanic Gardens, Burlington, On.