

NE1035 Annual Meeting

Greensys 2009

Quebec City, QC, Canada

June 14, 2009

Multistate Research Project Annual Station Publications Report

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TITLE: Developing and Integrating Components for Commercial Greenhouse
Production Systems

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REPORTING PERIOD: June 1, 2008 to May 31, 2009

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PUBLICATIONS:

Dissertations, Theses (Published)

Brechner, M.L. 2008. Some effects of light quantity and quality on secondary metabolites hyperforin, pseudohypericin, and hypericin in *Hypericum perforatum*. Doctoral Thesis, Cornell University Libraries, Ithaca, NY. 153 pp.

Fitz-Rodriguez, E., 2008, Intelligent decision support system for greenhouse tomato production. PhD Dissertation University of Arizona, AZ. (Advisor: G.A. Giacomelli, Committee: C. Kubota, C. Choi and Y. Son)

Justis, Ian. 2009. Development of a Short Term Storage Technique for Grafted Muskmelon Seedlings. MSc Thesis, Plant Sciences, University of Arizona, AZ. (Advisor: C. Kubota, Committee: U. Schuch, D. Ray.)

Lewis, M. 2009. The Commercial Feasibility of Hydroponic Lettuce Production in the Desert Southwest. University of Arizona, AZ. (Advisor: G.A. Giacomelli, Committee: L. Brigham, M. Kacira, R. Richman), Professional Science Masters Program.

Books (Published)

Proceedings

Kubota, C. and M. Kacira. (eds.) 2008. Proceedings of International Society of Horticultural Scientists (ISHS) International Workshop on Greenhouse Environmental Control and Crop Production in Semi-Arid Regions. October 20-24, Tucson, AZ, USA. *Acta Horticulturae* Vol. 797.

Book Chapters (Published)

Both, A.J. and D.R. Mears. 2008. Building and maintaining greenhouses for energy savings. In 'Horticulture: Principles and Practices', 4th ed. by G. Acquaah; included in Chapter 12 'Controlled-Environment Horticulture'. Prentice Hall, Inc. Upper Saddle River, NJ. pp. 406-417.

Refereed Journal Articles (Published)

- Barto, K., S. Enright, A. Eyles, C. Wallis, R. Chorbadjian, R. Hansen, D. Herms, P. Bonello and D. Cipollini. 2008. Effects of fertilization and fungal and insect attack on systemic protein defenses of Austrian pine. *Journal of Chemical Ecology* 34: 1392-1400.
- Buck, J.S., C. Kubota, and M. Jensen. 2008. Effect of mid-day reduction of high electrical conductivity treatment on the yield and quality of greenhouse cherry tomato. *HortTechnology* 18:460-466.
- Burnett, S.E. and L.B. Stack. Survey of the Organic Bedding Plant Industry in Maine. *Hort Technology* (in press). MAFES Publication #3056.
- Gent, M.P.N. 2008. Density and Duration of Shade Affect Water and Nutrient Use in Greenhouse Tomato. *J. Amer. Soc. Hort. Sci.* 133:619-627.
- Giacomelli, G.A., 2009. Engineering Principles Impacting High Tunnel Environments. *HortTechnology* 19(1):1-4.
- Kim, H.J., J.M. Fonseca, J.H. Choi, C. Kubota, and D.Y. Kwon. 2008. Salt in irrigation water affects the nutritional and visual properties of romaine lettuce (*Lactuca sativa* L.). *J. Agric. Food Chem.*, 56:3772–3776.
- Kim, K., J.Y. Yoon, H.J. Kwon, J.H. Han, J.E. Son, S.W. Nam, G.A. Giacomelli and I. Lee, 2008. 3-D CFD Analysis of Relative Humidity Distribution in Greenhouse with Fog Cooling System and Refrigerative Dehumidifiers. *Biosystems Engineering*, 100: 245-255.
- Kubota, C., M.A. McClure, N. Kokalis-Burelle, M.G. Bausher, and E.N. Roskopf. 2008. Vegetable Grafting: History, Use, and Current Technology Status in North America. *HortScience*. 43:1664-1669.
- Lefsrud, M., D. Kopsell, C. Sams, J. Wills, and A.J. Both. 2008. Dry matter content and stability of carotenoids in kale and spinach during drying. *HortScience* 43(6):1731-1736.
- Massa, D., Mattson, N.S., Lieth, J.H. 2009. Effects of saline root environment (NaCl) on nitrate and potassium uptake kinetics for rose plants: a Michaelis-Menten modeling approach. *Plant and Soil*. 318:101-115.
- Mattson, N.S., Lieth, J.H., Kim, W.S. 2008. Temporal Dynamics of Nutrient and Carbohydrate Distribution during Crop Cycles of *Rosa* spp. 'Kardinal' in Response to Light Availability. *Scientia Horticulturae*. 118(3):246-254.
- Massa, D., Mattson, N.S., Lieth, J.H. 2008. An empirical model to simulate sodium absorption and accumulation in a closed hydroponic system for rose culture. *Scientia Horticulturae*. 118(3):228-235.
- Mattson, N.S., Lieth, J.H. 2008. 'Kardinal' rose exhibits growth plasticity and enhanced nutrition absorption kinetics following nitrate, phosphate, and potassium deprivation. *Journal American Society Horticultural Science*. 133(3):341-350.

- Takahashi, N., Isogai, A., Ling, P. P., Kato, Y., and Kurata., K. 2008. Effects of Elevated Atmospheric Carbon Dioxide Concentration on Silica Deposition in Rice (*Oryza sativa* L.) Panicle. *Plant Production Science* 11 (3): 307-315.
- Takahashi, N., P.P. Ling, J.M. Frantz. 2008. Consideration for accurate whole plant photosynthesis measurement. *Environ. Control Biol.* 46:71-81.
- Takakura, T, C. Kubota, S. Sase, M. Hayashi, M. Ishii, K. Takayama, H. Nishina, K. Kurata, G.A. Giacomelli, 2009. Measurement of evapotranspiration rate in a single-span greenhouse using the energy-balance equation, *Biosystems Engineering*, 102 (3): 298-304.
- Thomson C.A., N.R. Stendell-Hollis, J.L. West, E.C. Cussler, L.M. McCune, M. Kroggel, H.J. Kim, and C. Kubota. 2008. High-lycopene consumption increases serum carotenoid levels but does not have decrease levels of oxidative stress and inflammation in healthy adults. *The Open Bioactive Compounds Journal.* 1:7-12.
- Wallis, C., A. Eyles, R. Chorbadjian, B. McSpadden Gardener, R. Hansen, D. Cipollini, D.A. Herms and P. Bonello. 2008. Systemic induction of phloem secondary metabolism and its relationship to resistance to a canker pathogen in Austrian pine. *New Phytologist* 177 (3): 767–778.
- Wu, M. and C. Kubota. 2008. Effects of electrical conductivity of hydroponic nutrient solution on leaf gas exchange of five greenhouse tomato cultivars *HortTechnology* 18:271-277.
- Wu, M. and C. Kubota. 2008. Effects of high electrical conductivity of nutrient solution and its application timing on lycopene of hydroponic tomatoes during ripening *Scientia Horticulturae* 116:122-129.
- Wu, C., Chiera, J. M., Ling, P. P., and Finer, J. J. 2008. Isoxaflutole treatment leads to reversible tissue bleaching and allows for more effective detection of GFP in transgenic soybean tissues. *In Vitro Cellular and Development Biology-Plant.*6:540-547.
- Yang, Y., Ling, P. P., Fleisher, D. H., Timlin, D. J., and Reddy, V. R. 2008. Non-contacting Techniques for Plant Drought Stress Detection. *Transactions of the ASABE* 51(4): 1483-1492.

Symposium Proceedings Articles (Published)

- Chen-Lopez, J.C., P.Waller, G.A.Giacomelli and M.Tuller, 2008. Physical Characteristics of Greenhouse Substrates for Automated Irrigation Management. *Acta Hort. (ISHS)* 797:333-338.
- Fulcher, A., R.L. Geneve, J. Buxton, and R. Gates. 2008. The Relationship between photosynthetic activity, container moisture and growth in *Hibiscus rosa-sinensis* L. *Proceedings of Southern Nursery Association Research Conference* 53: 549-552.
- Giacomelli, G. 2008. Controlled Environment Opportunities...Its not just tomatoes but a technology platform that will enhance the quality of life. *Proceedings of the 34th Agricultural Plastics Congress, American Society for Plasticulture.* Invited speaker.
- Kacira, M., S. Sase, A. Ikeguchi, M. Ishii, G. Giacomelli, N. Sabeh. 2008. Effect of Vent Configuration and Wind Speed on Three-Dimensional Temperature Distributions in a Naturally Ventilated Multi-Span Greenhouse by Wind Tunnel Experiments. *ActaHorticulturae*, 801: 393-400.

- Karlsson, M. and J. Werner. 2009. Hydroponic greenhouse lettuce production in subarctic conditions using geothermal heat and power. *Acta Horticulturae* (in press).
- Karlsson, M. and J. Werner. 2010. High tunnel covering materials for Northern field production. *Acta Horticulturae* (in press).
- Kubota, C. 2008. Use of grafted seedlings for vegetable production in North America. *Acta Horticulturae* 770:21-28.
- Lovichit, W., C. Kubota, C. Choi, and G.G. Schoonderbeek. 2008. Feasibility study for water recovery system for pad-and-fan cooled greenhouse in semiarid climate. *Acta Horticulturae* 797:315-320.
- Meyer, G.E., D. Mabie, F. Hay, S. Adams, T. Bartels, J. Fitzgerald. 2009. Improved instrumentation and controls for biomass heating and impact on greenhouse profitability. ASABE Annual International Meeting. pp. 23.
- Matsuda, R., C. Kubota, L.M. Alvarez, and G.A. Cardineau. 2008. Growth, development, and protein productivity of transgenic tomato plants expressing a *Yersinia pestis* antigen fusion protein F1-V in a greenhouse. *Acta Horticulturae* 797:381-385.
- Patterson, R.L., G.A. Giacomelli and P.D. Sadler. 2008. Resource and Production Model for the South Pole Food Growth Chamber. SAE International Paper No. 08ICES-0187, Proceedings ICES Conference, San Francisco, CA
- Sadler, P., R. Furfaro, G. Giacomelli and L. Patterson. 2008. Prototype BLSS Lunar Habitat. SAE International Paper No. 08ICES-0094, Proceedings ICES Conference, San Francisco, CA.
- Shelford, T.J. and L.D. Albright. 2008. Light management for controlled-environment agriculture. *Photonics Spectra* 42(3):49-54. Integrated Light and CO₂ Control to Optimize Commercial Greenhouse Plant Growth and Energy Efficiency. Paper No. 084619. ASABE, St. Joseph, MI
- van Iersel, M.W., S. Dove, and S. Burnett. The use of soil moisture probes for improved uniformity and irrigation control in greenhouses. *Acta Horticulturae* (in press).

Popular Articles (Published)

- Both, A.J. 2009. How does sustainability fit into your plan? *Greenhouse Management and Production (GMPro)*. May issue. pp. 26, 28-29.
- Both, A.J. Energy efficiency: Learning to conserve. *Greenhouse Grower* 25th Anniversary Issue. December 2008. pp. 56, 58.
- Both, A.J. and T. Manning. Solar and wind energy for greenhouses. *OFA Bulletin* No. 910. September/October 2008. pp. 1, 6-7.
- Burnett, S.E., R.G. Lopez, and N.S. Mattson. 2009. Designing a sustainable greenhouse. *Greenhouse Management and Production* (In Press).
- Burnett, S.E. 2009. Making the switch to organic substrates. *Greenhouse Management and Production*. March:22, 24, 25, 26.
- Burnett, S. and L.B. Stack. 2008. *Indiana Florist's Bulletin*. Energy Tax Incentives.
- Hall, T., J.H. Dennis, R.G. Lopez, B.A. Krug, and S.E. Burnett. 2008. How to market sustainability to consumers (3rd in a 3-part series). *Greenhouse Management and Production*. December:27, 28.
- Karlsson, M. and J. Werner. 2009. Growing under the midnight sun. *SNRAS/AFES Misc. Pub. No. MP 2009-06*.

- Karlsson, M. and J. Werner. 2009. Growing fresh vegetables: midnight sunlight and the earth's warmth. SNRAS/AFES Misc. Pub. No. MP 2009-10.
- Krug, B.A., S.E. Burnett, J.H. Dennis, and R.G. Lopez. 2008. Growers look at operating a sustainable greenhouse (1st in a 3-part series). *Greenhouse Management and Production*. October: 43-45.
- Ling, P.P. 2009. Harvesting heat with greenhouses. *Ohio Country Journal*. May issue.
- Lopez, R.G., S.E. Burnett, B.A. Krug, and J.H. Dennis. 2008. 8 steps to take to become sustainable (2nd in a 3-part series). *Greenhouse Management and Production*. November:26, 28, 29, 50.
- Mattson, N.S., S.E. Burnett, B.A. Krug, and R.G. Lopez. 2009. Becoming sustainable by reducing crop shrinkage. *Greenhouse Grower*. May:26,28,30,32.
- Mattson, N.S., Leatherwood, W.R. 2009. Why you should know the difference between nutrient solubility and mobility. *Greenhouse Management and Production (in press)*.
- Mattson, N.S. W.R. Leatherwood, and C. Peters. 2009. Planting the seeds for consumer success: are your irrigation and fertility practices backfiring on the end consumer and causing garden failure? *GrowerTalks Magazine*. 73(1):56-59.
- Mattson, N.S. W.R. Leatherwood, and C. Peters. 2009. Ten tips to save on fertilizer costs. *GrowerTalks Magazine*. 72(12):52-56.
- Mattson, N.S., Leatherwood, W.R., Peters, C. 2009. Nitrogen: all forms are not equal. *Greenhouse Management and Production*. 25(6):18-23.
- Mattson, N.S. 2008. Editor/contributor: Chapter 11 Growth Regulators for Greenhouse Floral Crops in K.C. Bennett (ed.) 2009 Cornell Guide for the Integrated Management of Greenhouse Floral Crops. Release date, Nov. 2008. 138-144.
- Mattson, N.S. 2008. Editor/contributor: Chapter 10 Growth Regulation of Greenhouse Floral Crops in K.C. Bennett (ed.) 2009 Cornell Guide for the Integrated Management of Greenhouse Floral Crops. Release date, Nov. 2008. 134-137.
- Leatherwood, W.R., Mattson, N.S. 2008. Microirrigate your way to a greener, more profitable operation. *Nursery Management and Production*. 24(11):27-32.
- Leatherwood, W.R., Mattson, N.S., Owen, J.S. 2008. Clay-amended substrates improve water use and nutrient efficiency. *Nursery Management and Production*. 24(10):41-43.
- Stack, L.B. and S. Burnett. 2008. Maine Growers Tackle the Energy Issue. OFA (An Association of Floriculture Professionals) Bulletin Number 910.
- van Iersel, M.W. and S. Burnett. 2008. Greenhouse irrigation automation: How to apply water efficiently. *Georgia Green Industry Association Journal* 19(5):39-43.
- van Iersel, M.W. and S. Burnett. 2008. Irrigation automation: Current technology. *Georgia Green Industry Association Journal* 19(4):18-22.

Presentations (Papers)

- Garland, K., S. Burnett, L. Stack, and D. Zhang. 2009. Influence of Daily Light Integral on Coleus Morphology and Leaf Variegation. *HortScience (In Press)*.
- Gent, M.P.N., J.C. White, B.D. Eitzer and M.J.I. Mattina. 2008. A novel phytoremediation system for soils contaminated with persistent organic pollutants. (Abstract) for 9th International Congress of Plant Pathology, Torino Italy, August 2008

- Gent, M.P.N. 2008. Effect of Shade on Water and Nutrient Use in Greenhouse Tomato. (Abstract) ASHS meeting, Orlando FL, July 2008. HortScience 43:1241
- Gent, M.P.N. 2008. Effect of Plant Size on Diurnal Variation of Nitrate and Sugars in Lettuce. (Abstract) ASHS meeting, Orlando FL, July 2008. HortScience 43:1197.
- Giacomelli, G.A. 2008. Greenhouse Sustainability: What's New in Technology, and How will Controlled Environment Plant Production Technology Address Global Issues. Invited keynote lecture, 30th Annual Canada Greenhouse Conference, Toronto, Canada. October 6-9. [Invited lecture].
- Giacomelli, G.A. 2008. Controlled Environments: Plant Production Technology Addresses Global Issues. Invited lecture, TTI/Vanguard conference, Controlled Environment Food Production Systems, "All Systems Green," St. Louis, MO. September 24-25. [Invited lecture].
- Giacomelli, G.A. 2008. Controlled Environments (CE): Systems to improve agricultural food production efficiency, productivity, and profitability for specialty crops. Invited presentation by Dr. Dan Cantliffe, Horticultural Sciences Department, Gainesville, FL July 25.
- Karlsson, M. 2009. Geothermal agriculture and food security. Alaska Geothermal Conference, April 29-30, Chena Hot Springs Resort, Alaska.
- Karlsson, M. and J. Werner. 2009. High tunnel covering materials for Northern field production. GreenSys 2009 International Symposium on High Technology for Greenhouse Systems. P-129, p. 157. June 14-19, Quebec City, Canada.
- Karlsson, M. and J. Werner. 2009. Snap bean yield and photosynthesis during twilight extended field conditions. Annual International Conference of the American Society for Horticultural Science, July 25-28, St. Louis, Missouri.
- Karlsson, M. and J. Werner. 2008. Modified field environments for high latitude crop production. International Meeting on Controlled Environment Agriculture, March 9-12, Cocoa Beach, Florida.
- Karlsson, M. 2008. Sustainable greenhouse production in the arctic. Pike's Waterfront Lodge, May 16, Fairbanks, Alaska.
- Karlsson, M. 2008. Alternative energy use in controlled environment agriculture. Energizing the West, Joint Meeting of the Directors of Western Agricultural Experiment Stations, Cooperative Extension Service and Land-Grant Schools and Colleges of Agriculture and Natural Resources, July 7, Fairbanks, Alaska.
- Karlsson, M. and J. Werner. 2008. Early day length sensitivity in sunflower. Annual International Conference of the American Society for Horticultural Science, July 21-24, Orlando, Florida.
- Karlsson, M.G. and J.W. Werner. 2008. Hydroponic greenhouse lettuce production in subarctic conditions using geothermal heat and power. International Symposium on Soilless Culture and Hydroponics, August 25-28, Lima, Peru.
- Kubota, C. and C.A. Thomson. 2008. Enhancing nutritional value of fresh tomato under controlled environments - A summary of collaborative research effort. International Symposium on Controlled Environment Agriculture, March 9-12, Cocoa Beach, Florida.
- Li, Q. and C. Kubota. 2008. Effects of supplemental light quality on growth and phytochemicals of baby leaf lettuce grown under white light. ASHS-2008, 21-24 July, Orlando, Florida.

- Matsuda, R., C. Kubota, L.M. Alvarez, J. Gamboa, and G.A. Cardineau. 2008. Biopharmaceutical production under controlled environments: photosynthetic rate, soluble protein concentration and growth of transgenic tomato plants expressing a *Yersinia pestis* F1-V antigen fusion protein. International Meeting on Controlled Environment Agriculture, 8-12 March, 2008, Cocoa Beach, FL.
- Sabeh, N., C. Kubota, G.A. Giacomelli, 2008. Evaporative Cooling – Water Use for Greenhouse Environmental Control, ASHS-2008 Annual Conference, 21-24 July, Orlando, Florida.
- Takahashi, N., Ling, P. P., Frantz, J., and Klingman, M. 2008. Time response improvement of a whole canopy photosynthesis measurement system. ASABE Annual International Meeting, Providence, RI, June 29 - July 2, 2008. ASABE Paper No. 085141.
- Werner, J. 2008. Future of greenhouse agriculture in Alaska. ChenaFest, October 4, Chena Hot Springs Resort, Alaska.
- Werner, J. 2009. Opportunities for horticulture and greenhouse production. Delta Farm Forum, February 28, Delta Junction, Alaska.
- Werner, J. 2009. Managing hydroponic production for success in Alaska. Sustainable Agriculture Conference, March 17-18, Fairbanks, Alaska.

Presentations (Oral)

- Bauerle, W.L. 2008. Building a new nursery crop growing system with environmentally friendly solutions to irrigation and plant nutrition. Novalis Growers, Charleston, SC. Nov 11.
- Bauerle, W.L. 2008. Targeted micro feeding strategies to optimize nursery crop production - pour thru method. Willoway Nurseries Inc., Avon, OH. Mar 10.
- Bauerle, W.L. 2008. Building a new nursery crop system with environmentally friendly solutions to irrigation and plant nutrition. Imperial Nurseries, Granby, CN. Dec 5.
- Fausey, B. A., Draper, C. M., Hansen, R. C., Keener, H. M., and Ling, P. P. 2008. Research and outreach efforts sustain the Ohio hydroponics industry. ISHS Symposium on Hydroponics and Soilless Culture. Lima, Peru. Aug 25-28.
- Hansen, R.C. 2008. Development of a research laboratory for growing lettuce hydroponically. Northeast Agricultural and Biological Engineering Conference. Aberdeen, MD. Jul 27-30.
- Ling, P.P. 2008. Horticultural Engineering Research at OSU. OARDC Plant Science Discovery Day. Wooster, OH. Oct 1-2.
- Ling, P.P. 2008. An overview of plant sensing and control research program. Introduction to Food, Agricultural and Biological Engineering, Freshman Engineering Class, The Ohio State University, Columbus, OH. Oct 14.
- Ling, P.P. 2008. Energy efficient plant production. Indiana Flower Growers Association Conference - Surviving the Energy Crisis. West Lafayette, IN. Oct 9.
- Ling, P.P. 2008. Greenhouse research and extension programs at OSU. Korean Extension Personnel. Wooster, OH. Jun 25.
- Ling, P.P. 2008. Energy efficient environmental control and alternative energy for greenhouse plant production. American Society for Horticultural Science Annual Meeting, Orlando, FL. Jul 23.

- Ling, P.P., 2008. Energy strategy for the future: a 30,000 ft overview to find low cost energy. OFA Short Course, Columbus, OH. Jul 14.
- Ling, P.P. 2008. Geothermal heat pump for homes and small business. Renewable Energy Workshop. Wooster, OH. Nov 12.
- Ling, P.P. 2009. Mechanical IPM – Humidity management and insect exclusion. Greenhouse Management Workshop. Columbus, OH. Jan 25.
- Ling, P.P. 2009. Precision Irrigation Management. 2009 Greenhouse Crop Production & Engineering Design Short Course. Tucson, AZ. Apr 26-29.
- Ling, P.P. 2009. Phytomonitoring technology and energy management decision support tool development for controlled environment plant production. University of Arizona. Tucson, AZ. Apr 30.
- Ling, P.P. 2009. Aerial environment monitoring. Agricultural Technical Institute. Wooster, OH. May 6.
- Ling, P.P. 2009. Hamilton County Extension Reloaded – greenhouse environmental control. Cincinnati, OH. Jun 3.
- Mattson, N.S. 2009. Fine tuning your greenhouse nutrition program. Monroe County Greenhouse School. Feb. 4, 2009. Rochester, NY (attendance 23).
- Mattson, N.S. and W.R. Leatherwood. 2009. Cutting costs and saving on fuel. Western New York Bedding Plant School. Jan. 30, 2009. Eden, NY (attendance 100).
- Mattson, N.S. 2009. Fertilizer feeding frenzy: How to save on fertilizer costs. Long Island Greenhouse School. Jan. 20, 2009. Ronkonkoma, NY (attendance 80).
- Mattson, N.S. and W.R. Leatherwood. 2009. Managing crops to save on heat. Capital District Bedding Plant Conference and Tradeshow. Hudson Valley, Nursery and Greenhouse Grower's School. Jan. 14, 2009. New Paltz, NY, (attendance 95).
- Mattson, N.S. and W.R. Leatherwood 2009. Managing crops to save on heat. Capital District Bedding Plant Conference and Tradeshow. Jan. 13, 2009. Latham, NY (attendance 90)
- Mattson, N.S. 2009. Tips to save on fertilizer costs. Capital District Bedding Plant Conference and Tradeshow. Jan. 13, 2009. Latham, NY (attendance 90)
- Mattson, N.S. 2008. Nutrient management: concepts and applications. CALS Occupational and Environmental Health. Nov. 13, 2008. Ithaca, NY (attendance 40)
- Mattson, N.S. 2008. Managing nutrition with salt tolerant and salt sensitive species. New England Greenhouse Conference. Nov. 6, 2008. Worcester, MA (attendance 25)
- Mattson, N.S. 2008. Proper Chrysanthemum nutrition: the good, the bad, and the ugly. Chrysanthemum Field Day. Sept. 30, 2008. Riverhead, NY (attendance 25)
- Mattson, N.S. 2008. A prescription for healthy plants: avoiding common nutrient disorders. Cornell Floriculture Field Day. July 22, 2008. Ithaca, NY (attendance 115)
- Mattson, N.S. 2008. Testing container media for pH and salts. IPM In-Depth Hands-on Workshop. July 21, 2008. Ithaca, NY. (attendance 30)

Presentations (Poster)

- Chiriboga, A., R.C. Hansen, D.A. Herms and R.N. Royalty¹. 2008. Effects of imidacloprid (Merit[®] 2F) on physiology of woody plants and performance of

- twospotted spider mite, fall webworm, and imported willow leaf beetle. Poster. 56th Annual meeting of the Entomological Society of America. Reno, NV. Nov 16-19.
- Lee, Wee Fong, P. P. Ling and H.M. Keener. 2009. Cooling capacity assessment of semi-closed greenhouses. 2009 OARDC Annual Research Conference. Columbus, OH. Apr 23.

Other Creative Works

- Albright, L.D. and D.S. de Villiers. 2008. Energy investments and CO₂ emissions for fresh produce imported into New York State compared to the same crops grown locally. New York State Energy Research and Development Authority. <http://www.nyserdera.org/publications/locally%20grown%20imported%20produce.pdf>. 231 pp.
- Both, A.J. 2009. Greenhouse energy conservation and efficiency. Proceedings of the Annual NJ Vegetable Growers' Association Meeting. January 13-15. Atlantic City, NY. pp. 76-78.
- Mitchell, C.A., A.J. Both, C.M. Bourget, C.S. Brown, R.J. Ferl, T.J. Gianfagna, H.W. Janes, T.L. Lomax, G.D. Massa, O. Monje, R.C. Morrow, K.O. Orvis, A.L. Paul, H.W. Sederoff, G.W. Stutte, R.M. Wheeler and N.C. Yorio. 2008. Enabling sustainable habitation at the lunar base. Abstract. Joint Annual Meeting of LEAG-ICEUM-SRR, October 28–31, Cape Canaveral, FL. LPI Contribution No. 1446. <http://www.lpi.usra.edu/meetings/leagilewg2008/pdf/4097.pdf>

Patents

- Albright, L.D., K.P. Ferentinos, I. Seginer, J.W. Ho and D. de Villiers. Systems and methods for providing optimal light-CO combinations. United States Patent 7,502,655. March 10, 2009.

Extension Publications

- N. Sabeh, and G. Giacomelli. 2008. Evaporative Cooling Water Use. University of Arizona Cooperative Extension Fact Sheet.

Abstracts

- Chia, P., Q. Li, and C. Kubota. 2008. Strategic use of far-red light and its control in plant production. International Workshop on Greenhouse Environmental Control and Crop Production in Semi-Arid Regions, October 20-24, Tucson, AZ. [Poster]
- Fulcher, A., T. Steele, E. Wilkerson, R. Geneve, R. S. Gates. 2009. Using transpiration chambers to detect initial transpiration in cuttings and quantify transpiration in seedlings. GreenSys 2009.
- Fulcher, A. and R.L. Geneve. 2009. A photosynthesis-based irrigation model for woody plants. HortScience 44:1037.

- Fulcher, A., R.L. Geneve, J. Buxton, and R. Gates. 2008. The relationship between photosynthetic activity, container moisture and growth in hibiscus. *HortScience* 43:1193.
- Guerrero, F. V. and M. Kacira. 2008. Determining Penman-Monteith coefficients for tomato crop grown in semi-arid greenhouse under three different greenhouse cooling settings. Presented at ISHS International Workshop on Greenhouse Environmental Control and Crop Production in Semi-Arid Regions, October 20-24. [Poster]
- Justus, I. and C. Kubota. 2008. Development of a cold storage technique for grafted muskmelon seedlings. International Workshop on Greenhouse Environmental Control and Crop Production in Semi-Arid Regions, October 20-24, Tucson, AZ. [Oral]
- Kacira, M. 2008. Energy efficient and high quality crop production through plant sensing in greenhouses. Presented at ISHS International Workshop on Greenhouse Environmental Control and Crop Production in Semi-Arid Regions, October 20-24. [Oral]
- Karlsson, M. and J. Werner. 2008. Modified field environments for high latitude crop production, p. 64. International Meeting on Controlled Environment Agriculture, Advance in Research and Design in CEA Facilities, March 9-12, Cocoa Beach, Florida.
- Karlsson, M. and J. Werner. 2008. Early day length sensitivity in sunflower. *HortScience* 43:1261-1262.
- Karlsson, M. and J. Werner. 2008. Hydroponic greenhouse lettuce production in subarctic conditions using geothermal heat and power. P-31, p. 80. International Symposium on Soilless Culture and Hydroponics, August 25-28, Lima, Peru.
- Karlsson, M. and J. Werner. 2009. High tunnel covering materials for Northern field production. GreenSys 2009 International Symposium on High Technology for Greenhouse Systems. P-129, p. 157. June 14-19, Quebec City, Canada.
- Karlsson, M. and J. Werner. 2009. Snap bean yield and photosynthesis during twilight extended field conditions. *HortScience* 44:1127.
- Kubota, C. and C.A. Thomson. 2008. Enhancing nutritional value of fresh tomato under controlled environments - A summary of collaborative research effort. International Symposium on Controlled Environment Agriculture, March 9-12, Cocoa Beach, Florida. [Oral]
- Matsuda, R., C. Kubota, L.M. Alvarez, J. Gamboa, and G.A. Cardineau. 2008. Biopharmaceutical production under controlled environments: photosynthetic rate, soluble protein concentration and growth of transgenic tomato plants expressing a *Yersinia pestis* F1-V antigen fusion protein. International Meeting on Controlled Environment Agriculture, 8-12 March, 2008, Cocoa Beach, FL. [Oral]
- Schoonderbeek, J. and M. Kacira. 2008. Large scale concentrated solar power and greenhouse: A perfect match with some challenges. Presented at ISHS International Workshop on Greenhouse Environmental Control and Crop Production in Semi-Arid Regions, October 20-24. [Poster]
- Story, D., M. Kacira, A. Akoglu and C. Kubota. 2008. A Machine Vision Guided System for Plant Health and Growth Monitoring in Controlled Environment Agriculture

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Websites

The University of Arizona Controlled Environment Agriculture Center web site:

<http://ag.arizona.edu/ceac>

Tomato Live2! Website: <http://ag.arizona.edu/ceac/tomlive/index.htm>

Controlled Environment Plant Physiology and Technology Lab:

<http://cals.arizona.edu/research/kubota/index.htm>

Workshop Sponsor

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Greenhouse Crop Production and Engineering Design Short Course. Eye on Economics and Energy, April 26-29, 2009. Continuing professional education short course, University of Arizona. Included a tour to EuroFresh Farms (Willcox, AZ). C. Hackathorn, J. Massey, **G. A. Giacomelli**, **C. Kubota**, **M. Kacira**, P. Rorabaugh, M. Jensen, and M. Kroggel. (*125 participants*)

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Workshop Participant

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