

University of Kentucky - NCR-101 Station Report

Progress:

Drs. Robert Anderson (KY) and Joey Norikane (KY) have initiated a study examining thermal control strategies for double poly greenhouses. The goal is to develop natural ventilation methods that would allow existing greenhouse facilities that were used in tobacco seedling production to be used in the cultivation of other plants. As tobacco production in Kentucky declines, the greenhouses used for tobacco seedling production will be available for the production of alternative crops. New strategies for environmental control will have to be developed for the new crops. The Haygrove high tunnels have been purchased and installation is anticipated later this spring.

Drs. Joey Norikane (KY) and Robert Anderson (KY) continue to evaluate a hypoxic fumigation treatment for infested greenhouse plants. Current testing examines the effect of the treatment on whole plants. Prior findings established the effectiveness of low-oxygen conditions ($O_2 < 1\%$) against several greenhouse pests. Testing has shown that high purity nitrogen fumigation treatment for 24-hours was detrimental to the plants. The current status is the system has been updated for 0 and 1% O_2 levels to be tested. Initial testing with the new system will examine the response of plants to the two levels of oxygen.

Drs. Robert Anderson (KY) and Joey Norikane (KY) are conducting a demonstration and feasibility study with Agri-Grow Technologies, Inc. (Mill Spring, NC) to grow strawberries in a controlled environment. Their concept was to use a vertical cropping system with a light distribution tube to deliver uniform radiation to the plants. Agri-Grow imported microwave powered sulfur lamps from the LG Corporation (Seoul, South Korea). The lamps went out of production in the US in the late 1990's, but the technology has been picked up in Korea. Testing of this lamps for plant lighting in growth chambers continues.

Impact:

The low-oxygen fumigation treatment system has commercial potential to be an environmentally friendly method to control greenhouse pests. Greenhouse production has become more and more specialized, where growers import/export product to other growers before delivery to the market. The plant tissue sent between growers is a vector for infestations at the different production facilities. The low-oxygen treatment could be used as an import/export control for biosecurity among greenhouse growers, nursery production facilities, and commercial markets.

Tobacco production in the state of Kentucky is declining, so the development of alternative crops has become a priority. Growers need to take advantage of existing production facilities, like the greenhouses used for tobacco seedling production. The environmental controls of the greenhouses are set-up for tobacco, but new control

strategies will be needed as alternative crops go into production. This will allow the environment of existing structures to be optimized to produce a higher quality product.

The microwave powered sulfur lamps could be a more efficient lighting source with longer life than conventional lighting fixtures. The spectral output from these lamps is broad spectrum light similar to sunlight.

PUBLICATIONS:

Dissertations, Theses (Published)

None for this reporting period

Books (Published)

None for this reporting period

Book Chapters (Published)

None for this reporting period

Refereed Journal Articles (Published)

- Kim, H.-H., R.M. Wheeler, J.C. Sager, and J.H. Norikane. 2005. Photosynthesis of lettuce exposed to different light qualities. *Environment Control in Biology*. 43(2):113-119.
- Norikane, J.H., J.C. Sager, R.M. Wheeler, G.W. Stutte, and H.-H. Kim. 2005. Characterization of Nutrient Solution Changes during Flow through Media. Paper No. 05ICES-2774. 35nd International Conference on Environmental Systems (ICES). Rome, Italy. 11-14 July 2005.
- Kim, H.-H., R.M. Wheeler, J.C. Sager, G.D. Goins, and J.H. Norikane. 2005. Evaluation of supplemental green light with red and blue light-emitting diodes growing lettuce in a controlled environment - A review of research at Kennedy Space Center. *Acta Horticulturae* (submitted).
- Norikane, J.H., Jessica J. Prenger, Donna T. Rouzan-Wheeldon, and Howard G. Levine. 2005. A Comparison of Soil Moisture Sensors for Space Flight Applications. *Applied Engineering in Agriculture*. 21(2): 211-216.
- Norikane, J.H., Scott B. Jones, Susan L. Steinberg, Howard G. Levine, and Dani Or. 2005. Porous Media Matric Potential and Water Content Measurements During Parabolic Flight. *Habitation*. 10(2): 117-126.
- Wilkerson, E.G., R.S. Gates, S. Zolnier, S.T. Kester, and R.L. Geneve. 2005. Predicting rooting stages in poinsettia cuttings using a root zone temperature-based model. *Journal of the American Society for Horticultural Science* 130(3):302-307.
- Wilkerson, E.G., R.S. Gates, S. Zolnier, S.T. Kester, and R.L. Geneve. 2005. Transpiration capacity in poinsettia cuttings at different rooting stages and the

development of a cutting coefficient for scheduling mist. *Journal of the American Society for Horticultural Science* 130(3):295-301.

Symposium Proceedings Articles (Published)

- Sager, J. C., A. J. Both, T.W. Tibbitts, and J.H. Norikane. 2005. Quality Assurance for Environment of Plant Growth Facilities. Paper No. 054137. Presented at the International ASAE Mtg. Tampa, Florida. Jul. 17-20.
- Norikane, J.H., R.G. Anderson, R.S. Gates, D.A. Potter, and L. Dunn. 2005. Development of a modified atmosphere treatment for arthropod pest control. Paper No. 054149. Presented at the International ASAE Mtg. Tampa, Florida. Jul. 17-20.
- Norikane, Joey H., R.G. Anderson, R.S. Gates, D.A. Potter, and L. Dunn. 2004. The system performance of a modified atmosphere treatment for arthropod pest control. Paper No. 044102. Presented at the International ASAE Mtg. Ottawa, Ontario, Canada. Aug. 1-4.

Popular Articles (Published)

- Duncan, G.A., R.S. Gates and M. Montross. 2005. Measuring relative humidity in agricultural environments. AEN-87. Cooperative Extension Service, University of Kentucky, Lexington, KY.

Presentations (Published Papers)

- Sager, J. C., A. J. Both, T.W. Tibbitts, and J.H. Norikane. 2005. Quality Assurance for Environment of Plant Growth Facilities. Paper No. 054137. Presented at the International ASAE Mtg. Tampa, Florida. Jul. 17-20.
- Norikane, J.H., R.G. Anderson, R.S. Gates, D.A. Potter, and L. Dunn. 2005. Development of a modified atmosphere treatment for arthropod pest control. Paper No. 054149. Presented at the International ASAE Mtg. Tampa, Florida. Jul. 17-20.
- Norikane, Joey H., R.G. Anderson, R.S. Gates, D.A. Potter, and L. Dunn. 2004. The system performance of a modified atmosphere treatment for arthropod pest control. Paper No. 044102. Presented at the International ASAE Mtg. Ottawa, Ontario, Canada. Aug. 1-4.

Contact Information:

Joey Norikane, Ph.D.
University of Kentucky
Biosystems and Agricultural Engineering Dept.
128 C.E. Barnhart Building, Room 208
Lexington, KY 40546-0276
tel.: (859) 257-3000 ext. 208
fax: (859) 257-5671
email: jnorikane@bae.uky.edu
http://www.bae.uky.edu/People/Faculty/norikane_index.htm