

Duke University Phytotron
2007 Station Report to the NCERA-101 Committee
Submitted by Norman Hill

NEW FACILITIES AND EQUIPMENT

The data acquisition system was replaced on sixteen of the EGC model M-13 reach-in chambers. The new system consists of National Instruments cFP-2010 Ethernet controller modules and cFP-TC-120 FieldPoint™ thermocouple (type T) input modules using LABVIEW™ software.

A Plant Root Visualization and Characterization System, model PRVCS1, (a high resolution and non-destructive x-ray system to image plant roots) was installed by Phenotype Screening Corporation. This x-ray system is being used by Dr. Philip Benfey's lab to acquire images of rice plant roots at different time points. The long-term goal is to identify the genes responsible for root system architecture traits. This technology could make contributions to the utilization of the resources of plant genomics toward agricultural improvement.

The 40 year-old glycol pumping and piping systems feeding the large (L), step-in (S), and tall (T) chambers are being replaced.

ACCOMPLISHMENT SUMMARIES

Research using the mustard plant *Arabidopsis* for genomic research is increasing. The information gained from *Arabidopsis* research may help develop plants genetically modified to resist drought, resist pathogens, and grow in salty soil and higher temperatures due to global warming. To accommodate the increased research at the Duke Phytotron using *Arabidopsis*, we have converted four of the large (L) walk-in chambers to shelf lighting to maximize *Arabidopsis* cultivation.

An underground conduit system was installed connecting the Phytotron and the TUNL (Triangle Universities Nuclear Laboratory) allowing for direct transfer of the ¹¹C isotope to the Phytotron C-11 chamber. This system will allow for real-time observation of the movement of carbon fixed by plants.

IMPACT STATEMENTS

A corn breeding research program at the Duke Phytotron, by using hybrids of corn ancestors, has developed rootworm resistant corn hybrids.

A private corporation using the Duke Phytotron facility has (1) discovered a new class of genes that provide high levels of tolerance to the herbicide glyphosate, (2) discovered several new families of insecticidal genes with proven activity against the European corn borer, (3) discovered a gene for resistance to corn rootworm, and (4) developed technologies to create a transgenic solution to soybean cyst nematode.

SELECTED PUBLICATIONS

Eubanks, M.W. 2006. Genetic bridge to utilize *Tripsacum* germplasm in maize improvement. *Maydica*, vol. 51 no.1.

Maestre, F.T., M. Bradford and J.F. Reynolds. 2005. Soil nutrient heterogeneity interacts with elevated CO² and nutrient availability to determine species and assemblage responses in a model grassland community. *New Phytologist* (in press).

McElrone, A.J., C.D. Reid, K.A. Hoye, E. Hart, and R.B. Jackson. 2005. Elevated CO² reduces disease incidence and severity of a red maple fungal pathogen via changes in host physiology and leaf chemistry. *Global Change Biology*, v.11, pp. 1828-1836.