

**North Carolina State University Phytotron
2008 Station Report for NCERA-101
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Accomplishment Summaries

Experiments at the NCSU Phytotron encompass many areas of research. Although there are many interesting projects, just a few of the highlights are mentioned here and a summary of our accomplishments is published annually on our website (<http://www.ncsu.edu/phytotron/>).

Studies examining drought tolerance in plants ranging from turfgrass to soybeans and tomatoes were prevalent during 2007. These experiments mirror the lack of rainfall during 2007 and the projection of limited availability of water from lakes and ponds during the 2008 growing season in NC.

Tomato seeds from experiments conducted at NCSU are being grown at the International Space Station to examine "transgenic tomato plants that are modified such that the signaling pathway related to how they respond to gravity is altered." Similar plants are being grown at NCSU to compare growth responses to the ones growing in space (Khodakovskaya and Sederoff).

Impact Statements

Tables summarizing the usage of our facility by growth chamber type, department and crop are listed at the end of the report and a more detailed report is published annually on our website (<http://www.ncsu.edu/phytotron/>).

Usage for all growth chambers in 2007 was 96% of the recommended optimal occupancy, or 79% of maximal occupancy (Table 1). The 17 individually programmed A-chambers were occupied at 131% of optimal capacity and the five "standard" A-chambers had a 64% optimal occupancy rate. For 2007, total A-chamber usage was 116% the recommended optimal occupancy. Usage of B-chambers was at 86% and C-chambers, 82 % for the year.

87 different projects were conducted in the Phytotron during 2007 by faculty and students from 10 departments in the Colleges of Agriculture and Life Sciences, and Forestry (Table 2). The Crop Science Department used the largest amount of space in 2007 (nearly 33%, for 21 different projects). Secondly, the Plant Pathology Department used more than 22% of the space for 17 projects. The Plant Biology Department used nearly 14% of the space for 17 projects, and Horticultural Science used over 11% for 12 projects. Entomology, and Soil Science each had a space use allocation of approximately 3%. Biological Sciences used approximately three percent for General Biology student projects.

14% of the space used in the Phytotron during 2007 was used to grow Arabidopsis (Table 3). Research with agronomic crops included soybean (4%), corn (5%), and tobacco (10%). Space for research on vegetable crops used 11% of the space in 2007, weeds, 4%, ornamentals, 8% and for trees, 4%. The 'Demonstration' category (3%) included space for plants grown for display during tours of the facility.

Selected Publications

Azhakanandam, K., S. M. Weissinger, J. Nicholson, R. Qu and A. K. Weissinger (2007) Amplicon-plus Targeting Technology (APTT) for rapid production of a highly unstable vaccine protein in tobacco plants. *Plant Mol. Biol.* 63: 393-404.

Byfield, G. and R.G. Upchurch. 2007. Effect of Temperature on Microsomal Omega-3 Linoleate Desaturase Gene Expression and Linolenic Acid Content in Developing Soybean Seeds. *Crop Sci.* 47:2445-2452.

Dong, S., L. P. Tredway, H. D. Shew, G.-L. Wang, E. Sivamani, and R. Qu (2007) Resistance of transgenic tall fescue to two major fungal diseases. *Plant Sci.* 173: 501-509.

Israel, D.W., P. Kwanyuen, J.W. Burton, and D.R. Walker. 2007 Response of Low Seed Phytic Acid Soybeans to Increases in External Phosphorus Supply. *Crop Sci* 47:2036-2046.

Khodakovskaya, Mariya, Christopher Brown, Jacob B. Freeman, Louis Stodieck and Heike W. Sederoff. 2007. Triple traits improvement in genetic engineering tomatoes for space exploration, American Society for Gravitational and Space Biology Annual Meeting. Abstract # 52.

Table 1. CHAMBER USAGE SUMMARY, 2007

Chamber		% Optimal	% Maximum
A-chambers	(17 individual)	131	82
A-chambers	(5 standard)	64	40
A-chambers	(22)	116	72
B-chambers	(10)	86	86
C-chambers	(22)	82	82
Glasshouses	(5)	46	37
HID Walk-in	(2)	95	95
Tall Chamber	(1)	63	59

* Dimensions of Chambers are: Utilization of all growth chambers during 2007:

A = 8' x 12' x 7'h

Optimal Usage = 96

B = 8' x 4' x 7'h

% Maximal Usage = 79

C = 4' x 3' x 4'h

H = 10' x 6' x 8'h

T = 16' x 12' x 7'-15'h

Table 2. DEPARTMENT USAGE SUMMARY, 2007

Department	% Total Use-Days	# Projects
Crop Science	33	21
Entomology	3	4
Forest Resources	1	1
Genetics	1	2
Horticultural Science	11	12
Microbiology	1	2
Phytotron	5	3
PlantBiology	14	17
PlantPathology	22	17
Soil Science	3	2
Teaching	3	5
Zoology	1	1

*87 Studies Conducted in the Phytotron During 2007

Table 3. CROP TYPE SUMMARY, 2007

Crop	% Total Use-Days
Arabidopsis	14
Corn	5
Cotton	3
Demonstration ^a	3
Fruit ^b	1
Insects ^c	2
Maintenance	1
Ornamentals ^d	8
Other ^e	12
Rice	3
Soybean	4
Tobacco	10
Trees ^f	4
Turfgrass ^g	15
Vegetable ^h	11
Weeds ⁱ	4

Includes:

^aCelosia, Corn, Himalayan Barley, Marigolds, Mung Beans, Peas, Pigweed.

^bCorn, Rye, Teosinte

^cArgentine ants, Honey Bees

^dDogwood, Geranium, Helleborus, *Setcreasia purpurea*, Rhododendron, Roses

^eArtemisia, Clover

^fAspen, Mommi Fir, Oak

^gBentgrass (*Agrostis palustris*), Bermudagrass, and Tall Fescue

^hCucumber, Potato, Tomato, Watermelon

ⁱJapanese Stiltgrass, Meadow Beauty, Switch grass,