North Carolina State University Phytotron
2007 Station Report for NCERA-101

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Accomplishment Summaries

In 2006, our web-based system linking user submission of proposals and data collection of space use has been refined. Both phytotron committee members approving user projects and researchers have been transitioned to the new system. For phytotron staff, the new system has resulted in less paperwork and less reentry of data. Our next step is to begin working on remote access to growth chamber data and software allowing growth chamber programs to be altered from a distance.

Impact Statements

Research conducted at the NCSU Phytotron varies widely by department and a summary of our accomplishments is published annually on our website (http://www.ncsu.edu/phytotron/). Tables summarizing the usage of our facility by growth chamber type, department and crop are listed at the end of the report.

Usage for all growth chambers in 2006 was 102% of the recommended optimal occupancy[1], or 84% of maximal occupancy (Table 1). The 17 individually programmed A-chambers were occupied at 147% of optimal capacity and the five "standard"[2] A-chambers had a 78% optimal occupancy rate. For 2006, total A-chamber usage was 131% the recommended optimal occupancy. Usage of B-chambers was at 82% and C-chambers, 87 % for the year.

83 different projects were conducted in the Phytotron during 2006 by faculty and students from 10 departments in the Colleges of Agriculture and Life Sciences (Table 2). The Crop Science Department used the largest amount of space in 2006, nearly 35 %, for 24 different projects. Secondly, the Plant Biology Department used more than 19% of the space for 18 projects. The Plant Pathology Department used nearly 16% of the space for 16 projects, and Horticultural Science used over 6% for 9 projects. Genetics, had a space use allocation of approximately 5%. Biological Sciences used approximately three percent of the space during the BIO 183 class for student projects.

15% of the space used in the Phytotron during 2006 was used to grow arabidopsis while 13% was allocated for growing soybean (Table 3). Research with other agronomic crops included corn (12%),) and tobacco (13%). Space for research on vegetable crops used 10% of the space in 2006, weeds 4%, ornamentals, 2% and for trees, 5%. The 'Demonstration' category (2%) included space for plants grown for display during tours of the facility.

Selected Publications

Chen, X.,W. Yang, E. Sivamani, A. Bruneau, B. Wang & R. Qu (2005) "Selective Elimination of Perennial Ryegrass by Activation of Pro-herbicide Through Engineering E. *coli arg*E Gene," Molecular Breeding 15: 339-347

Overstreet, L.F., J.W. Rideout, C.D. Raper, Jr. & J.F. Thomas (2006) "Boron Deficiency and Chilling Injury Interactions in Tobacco Transplants Grown in the Float System," Tobacco Science 46:28-34

Ristaino, J. B., Johnson, A., Blanco-Meneses, M., and Liu, B. (2007) "Identification of the Tobacco blue mold pathogen, *Peronospora tabacina* by PCR," Plant Dis. Accepted

Upchurch, Robert G., Mark S. Rose, Mohamed Eweida, & Weineng Zuo (2005) "Expression of the Cercosporin Transporter, CFP, in Tobacco Reduces Frog-eye Lesion Size," Biotechnology Letters 27: 1543-1550

Vian,A., & E. Davies (2006) "Two different wound signals evoke very rapid, systemic CMBP transcript accumulation in tomato," Plant Signaling and Behavior 1 (5) 261-26

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[1] Usage calculations for A-chambers assume that the chambers contain a maximum of 24 units or 'trucks'. Optimal occupancy is set at 15 units, however, in order for there to be space for the investigator to work, for the staff to water plants and change lamps and wall fans, and to prevent overcrowding and shading of experimental material. B- and C-chambers usage is calculated on the basis of maximum occupancy since their small sizes allow for reach-in care by investigators and staff.

[2] Standard A-chambers are set at 4 day/night temperature regimes of 26/22, 22/18, and 18/14 C. There are 2 chambers for each temperature regime, both programmed for a 9-hr high intensity light period coincident with the day temperature; one of the two chambers has a 15-hr dark period following the high intensity light period (simulating a short-day photoperiod) and the other chamber has a 3-hr low intensity light interruption provided by the incandescent lamps during the middle of the dark period (simulating a long-day photoperiod).

Table 1. **CHAMBER USAGE SUMMARY, 2006**

Chamber*		**% Optimal**	**% Maximum**
A-Chambers	(17 Individual)	147	92
A-Chambers	(5 Standard)	78	49
A-Chambers	(22)	131	82
B-Chambers	(10)	82	82
C-Chambers	(22)	87	87
Glasshouses	(5)	34	27
HID Walk-In	(2)	70	70
Tall Chamber	(1)	48	44

* Dimensions of Chambers are:
A = 8' x 12' x 7'h
B = 8' x 4' x 7'h
C = 4' x 3' x 4'h
H = 10' x 6' x 8'h
T = 16' x 12' x 7'-15'h

Utilization of all growth chambers during 2006:
Optimal Usage = 102
% Maximal Usage = 84

Table 2. **DEPARTMENT USAGE SUMMARY, 2006**

Department	**% Total Use-Days**	**# Projects**
Crop Science	35	24
Entomology	6	3
Forest Resources	1	1
Genetics	5	3
Horticultural Science	6	9
Microbiology	1	2
Phytotron	7	4
Plant Biology	19	18
Plant Pathology	16	16
Soil Science	1	1
Teaching	3	2

*83 Studies Conducted in the Phytotron During 2006

Table 3. **CROP TYPE SUMMARY, 2006**

Crop	**% Total Use-Days**
Arabidopsis	15
Corn	12
Cotton	2
Demonstration[a]	2
Grains[b]	3
Insect[c]	1
Maintenance	2
Ornamentals[d]	2
Other[e]	8
Rice	3
Soybean	7
Tobacco	13
Trees[f]	5
Turfgrass[g]	11
Vegetables[h]	10
Weeds[i]	4

Includes:
[a]Celosia, Corn, Himalayan Barley, Marigolds, Mung Beans, Peas, Pigweed.
[b]Wheat, Rye
[c]Argentine Ants, Honey Bees
[d] Dogwood, Geranium, Helleborus, *Setcreasia purpurea*, Rhododendron
[e]Clover, *Lotus japonicus*, *Medicago truncatula*,
[f] Aspen, Fraser Fir, Oak,
[g] Bentgrass (*Agrostis palustris*), Bermudagrass, Saint Augustinegrass, and Tall Fescue
[h] Cucumber, Potato, Tomato, Watermelon
[i]*Commelina benghalensis*, Japanese Stiltgrass