NCERA-101 Wisconsin Report

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1. New Facilities/ Equipment:

Building Renovation: Completion of $7,000,000 renovation including replacement of pneumatic temperature control valves with digital valves and redesign of hot and cold glycol loops. Completed rebuilding of: six controlled environment cold rooms capable of -20 ^{o}C; RO water system; clean steam relative humidity system for research rooms; light plenums in half of research rooms; and sheave/pulley assemblies for air handling units. Common conference room has been renovated while hallways and locker rooms are in process.

Website: Redesign of Biotron Laboratory website: biotron.wisc.edu

Control System: Completion of installation and tuning of Field Equipment Controls (FEC) and Metasys Extended Architecture human machine interface (HMI) which replaces former in-house custom control system from Johnson Controls, Inc. (JCI).

LED lighting expansion: Additional 14.5 m^2 greenhouse room outfitted with six 325 watt Lumigrow Pro 325 LED light fixtures to replace six 675 watt high pressure sodium lights.

2. Unique Plant Responses:

Tropical variety of giant corn grows to 6.5 m height in Biotron two-story Controlled Environment Room with Rain Simulator: In a controlled environment room (4.0 m wide; 2.9 m deep; 9.0 m tall), originally designed to house trees and birds, a tropical variety of giant corn was grown to a height of 6.5 m. The room utilizes height-adjustable metal halide lights producing an average irradiance of 7-800 umol; controlling for 25oC day and 18oC night; 80 % RH using clean RO generated steam. PVC structures (3.5 m in height) support each plant which otherwise collapse under their own weight. Within the room a rain simulator, using reverse osmosis water, allows the investigator to create a rain event within a 1.8 m x 1.6 m x 0.3 m tall basin.

3. Accomplishment Summaries:

The Biotron Laboratory, in conjunction with the University of Wisconsin Department of Environment, Health and Safety (E,H & S), has developed and implemented signage for standard operating procedures (SOPs) and a plant-specific recombinant DNA Biosafety Level 1-P symbol. To assure principal investigator compliance with the NIH Health Guidelines for recombinant DNA research, signage placed at each research room entrance includes rDNA door cards and an investigator-signed SOP for working with and disposing of rDNA plants. Hallway and entrance signage introducing the rDNA plant symbol, as well as, alerting building occupants of the presence of rDNA research. The research room and facility-level posts are based on similar signage at the Rothamsted Research, Controlled

Environment and Glasshouse Facilities, led by Dr. Julian Franklin on September 12, 2012 as part of the University of Cambridge international joint meeting of the UK-CEUG/NCERA-101/ACEWG.

Signage is downloadable at: http://www.ehs.wisc.edu/forms-manuals-signs.htm

4. Impact Statements:

Biotron Laboratory Greenhouse supplemental LED and induction (IND) lighting found to be viable alternatives to high pressure sodium (HPS) in relative seed yield trails of Rapid Cycling *Brassica rapa* (summer, fall 2013 by Jackson Hetue, of Rapid Cycling Brassica Collection with Bjorn Karlsson and Jacob Schoville, UW Biotron Laboratory). LED (Lumigrow Pro 325) and IND (iGrow IGF-400-VG-CM) were compared to HPS lights in 16.7 m^2 rooms. In the first of two rounds, HPS lamps yielded 7% more seed than LED ; IND lamps yielding 23 % less than HPS. In the second round, LED yielded 2% more seed HPS; IND 10% less than LED. Both LED arrays and IND lamps yielded more seeds per watt of power consumed as compared to HPS.

5. Other relevant activities or information:

Biotron Plant Research Manager, Bjorn Karlsson, presented the following outreach presentations:

Karlsson, B.H. 2014. Biotron: Controlled Environment Research. Three oral presentations to faculty of Horticulture, Agronomy, Soil Science. UW-Madison, Madison WI 53706.

Biotron Plant Research Manager, Bjorn Karlsson, and Jacob Schoville, Horticulture Technician, presented the following outreach presentations:

Schoville, J. and Karlsson, B.H 2014. Biotron: Controlled Environments for Plant Research. Oral presentation to UW-Madison, Environmental Horticulture class . UW-Madison, Madison WI 53706

Karlsson, B.H. and Schoville, J. 2015. Oral presentation on light and temperature control at the Research Plant Care Workshop: Best Practices in Controlled Environment Research Plant Care. UW-Madison Horticulture Department and D.C. Smith Instructional Greenhouse. UW-Madison, Madison WI 53706.
http://plantcare.wisc.edu/plant-care-workshop/

Under the supervision of Dr. Isabelle Girard, Biotron Laboratory Associate Director, Horticulture Technician, Jacob Schoville and Jackson Hetue, curator of the Rapid Cycling Brassica Collection presented the following outreach presentation:

Schoville, J. and Hetue, J. 2015. WI Fast Plants from Science House and The Biotron. Science House. Science Expeditions. UW-Madison, Madison WI 53706.
http://www.science.wisc.edu/documents/2015.03.19_Science_Expeditions_Guidebook.pdf