

WISCONSIN NCR-101 REPORT

April, 2003

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Horticulture: A chamber was purchased from Percival to subject plants to simulated frost and winter conditions for study of the mechanisms of freezing injury and winter survival in plants. This walk-in growth chamber has been obtained to operate down to -15C with lights off and down to -5C with lights on. Initially problems were found in holding freezing temperatures for long periods of time, but with reworking of the controls the chamber has been operating effectively for the last 7 months.

Biotron: The energy upgrade (Wisconsin Energy Initiative costing 373K) was completed last year and we are waiting for our first report on how much energy we have saved. The initial projection was to save 37.3K/year to pay for the project over 10 years. The Biotron installed a light sensor (Celestial MK7-B-CS-0/10 with 0-10VDC output made by PLC MULTIPOINT INC.) in the greenhouse complex that was set so that when the natural light levels reaches 600 PPF the computer shuts off/on the sodium lamps. Based on feedback from the investigators we have lowered the cut off to 500 PPF but added the capability to set individual A/C greenhouse rooms to a natural light level determined by the investigator. This has been well received by the investigators and has reduced our A/C costs. The occupancy of the Biotron and greenhouse continue to be high; Biotron animal rooms 95%, Biotron plant rooms 75%, greenhouse rooms 100%. The assignment of Biotron rooms is about 75% animal projects, 20% plant projects and 5% material/product testing. The plant percent might seem low but most present investigators prefer the A/C greenhouse rooms as opposed to the Biotron controlled environment growth rooms. Current rates are the following; Biotron animal rooms \$0.162/sq. ft./day, Biotron plant rooms \$0.167/sq. ft./day and A/C greenhouse rooms \$0.054/sq. ft./day.

WCSAR: The Wisconsin Center for Space Automation and Robotics (WCSAR) is developing a Commercial Plant Biotechnology Facility with over 2500 cm² of growing area for conducting long-term plant research on the International Space Station. This is scheduled for launch in 2/05. To date, a training unit and high-fidelity ground unit have been developed. The flight hardware will be completed in July 2004. The Advanced Astroculture unit has successfully completed the production of two generations of Arabidopsis and one generation of soybeans from seed to seed on the ISS. The next flight of this unit on the ULF-1 mission is scheduled for 7/21/03(?) and will produce seeds from aromatic plants. WCSAR lost two experiments aboard the Columbia STS-107 mission. One experiment was with the commercial partner, International Flavors and Fragrances, Inc., and involved cultivation of two aromatic plants, a miniature rose and an Asian rice flower (*Agalia odoratae*), inside the AstrocultureTM unit. At different stages of blossoming, volatile compounds emitted by the flowers were collected using the WCSAR-developed Solid Phase Microextraction device and were preserved inside the AstrocultureTM unit. The objective of this experiment was to exam how the microgravity environment may affect the spectrum and structures of volatile compounds produced by the flowers, and whether unique compounds may be formed in the microgravity environment. The second experiment, sponsored by the Producers' Natural Processing, Corp., was to evaluate the effects of microgravity environment on the efficiency of the *Agrobacterium tumefaciens*-mediated gene transfer system designed for recalcitrant crops such as soybean, corn, wheat, rice, and etc. Similar experiments conducted during STS-95 and STS-101 using soybean seeds suggested that the microgravity environment might enhance the transformation efficiency of this system.