NCR-101
Committee on Controlled Environment Technology and Use
Station Report 2003
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Montreal, Canada
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Summary

The Phytotron has launched a new website with a wide range of information and documentation relevant to managers and users of controlled environment facilities.

http://www.mcgill.ca/biology/Phytotron/

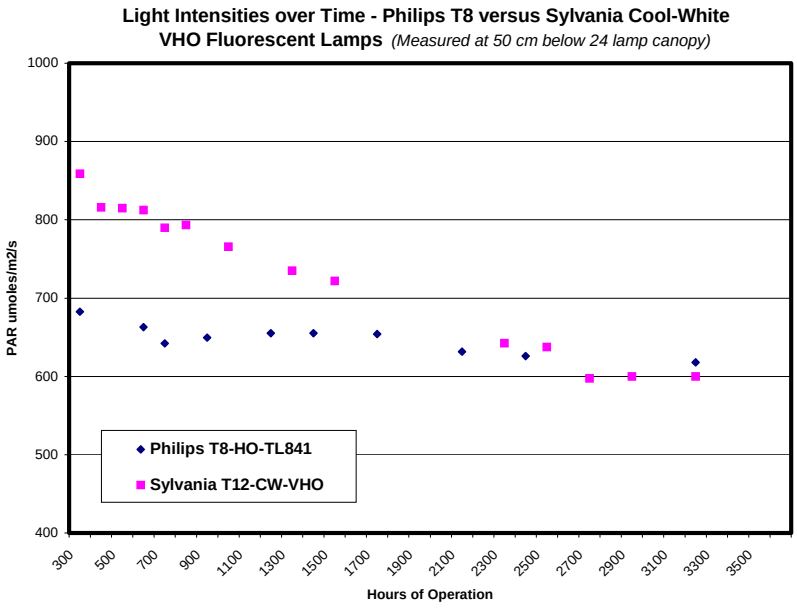
Of particular interest to operations personnel are the sections on rights & responsibilities of users & staff, IPM pest management protocols, growth chamber maintenance protocols & our methodology for CO_2 control in growth chambers. Over the past fiscal year (June 01-May 02), a total of 66 research projects were conducted by 60 researchers. Utilization of the growth chambers (22 units) averaged 96% of capacity while greenhouse usage (10 units) averaged 58% and tissue culture zone (3 units) usage averaged 53%.

New Equipment & Installations

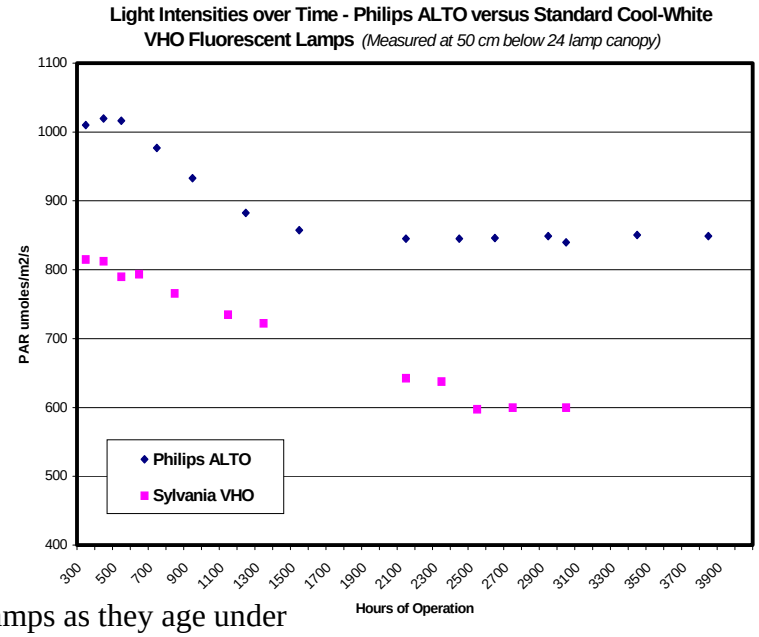
Funds received from the Canadian Foundation for Innovation (CFI) are contributing to the refurbishment of control and mechanical systems in the facility, the installation of a blackout room in the greenhouse and the purchase of four 7ft^2 growth chambers. An additional 3 7ft^2 growth chambers were transferred from the Biology department, installed and upgraded. We are now looking into the possibility of renovating our tissue culture zone into a Microcosm Research Centre. This project would add 6 new tissue culture chambers (each 16 ft^2) and a Beckman Robotic processor for microcosm studies.

T8 Canopy Retrofit

This past year, in collaboration with Conviron, we initiated a study to evaluate the costs and benefits of converting an existing T12 VHO fluorescent canopy to a T8 electronic ballast canopy (PGW36 – 36 ft^2 chamber). Some of the advertised benefits of the T8 lamp & ballast technologies include: increased energy efficiency (>50% savings), longer rated lamp lifetime (>20,000 hrs) and reduced lamp decay (>90% of original output intensity at end of life). The installation was relatively simple requiring under 8 hours of work. Initial light intensity readings of the T8 canopy were approximately 20% lower than a comparable T12 canopy. The T8 lamp values remained relatively unchanged over 3,000 hours of operation dropping only 50 umoles/m^2/s or 7% below initial values. By comparison, a standard T12-CW-VHO canopy has a higher initial intensity, but values decrease by 30% over this same time interval. There were no noticeable plant responses to this new light source in our chamber (*Brassica spp.* 350 $\mu mol \cdot m^{-2} \cdot s^{-1}$). We are continuing this study to evaluate energy use, "working lifetime" and output maintenance values for lamps in this canopy.



ALTO Lighting Study – (continued)



Last year, we reported on a new fluorescent lamp manufactured by Philips (F96/T12/41U/VHO/ALTO) which may be used in existing VHO socket and ballast installations. Initial light measurements (see last year's report) found the Philips ALTO lamps produced between 18 – 22% more light than our standard Sylvania VHO lamps after 100 hours of operation. Light intensity decay over the first 3000 hours was ~15% for the ALTO lamps compared to 30% for the Sylvania VHO lamps. At 4,000 hours, ALTO lamps were maintaining a surprisingly high output approximately 85% of starting values. The Phytotron will continue to evaluate these lamps as they age under working conditions and will attempt to determine a "working lifetime" and operating cost for these lamps. N.B. The ALTO lamps retail for ~60% more than the standard VHO lamps (in Montreal).

Spectral distributions for the two lamp types are presented below for comparative purposes. (Data courtesy of Conviron ltd.). We found no significant differences in plant performance under the ALTO lamps. One species of *Amsinkia* typically grown under very high intensities (800-1000 µmol·m^{-2}·s^{-1}) increased overall biomass and appeared less water-stressed in the ALTO chamber. We suspect that this may have been related to a reduced radiative stress load and not lamp spectral quality. In order to obtain the desired light levels for this study, we typically use 44 unbarriered VHO lamps positioned 1 meter above the plants. In contrast, the ALTO canopy was positioned 2 meters above the plants and required only 24 lamps to attain the same intensity of light! Clearly the ALTO lamps will benefit those users with aging chambers and/or aging ballasts that need to obtain high light intensities for their experiments.