NCR-101
Committee on Controlled Environment Technology and Use
Station Report 2001-2
McGill University Phytotron
Montreal, Canada
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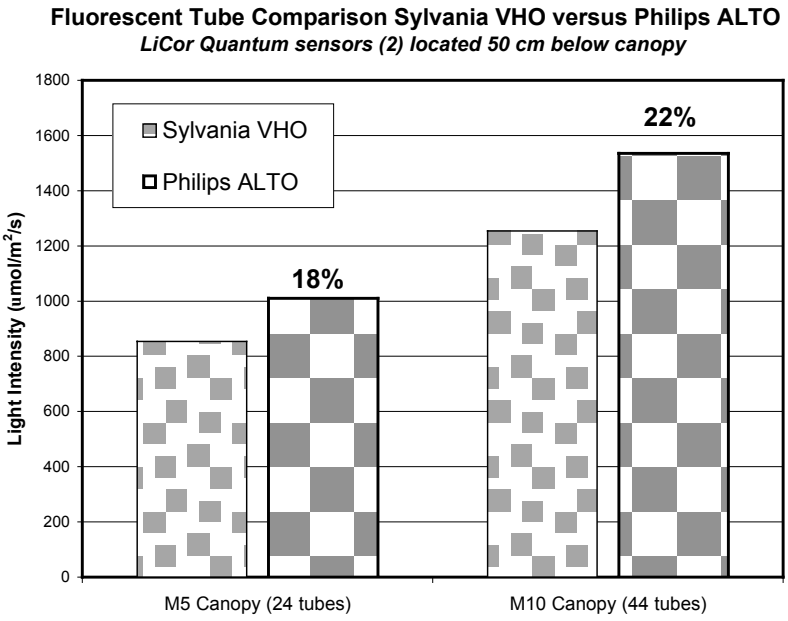
Summary

The McGill Phytotron will be celebrating the completion of its 15th year of operation in November 2002. The facility continues to be actively used. Over the past fiscal year (June 00-May 01), a total of 85 research projects were conducted by 62 researchers. Projects in evolutionary ecology and plant molecular biology dominated the use of the facility. Utilization of the growth chambers (22 units) averaged 85% of capacity while greenhouse usage (10 units) averaged 69% and tissue culture zone (3 units) usage averaged 68%. This past year, after 15 years of service, Dr. Martin Lechowicz announced that he would step down from his position as scientific director of the facility. Martin is replaced by Dr. Dan Schoen, evolutionary ecologist and active Phytotron user.

New Equipment - Lighting

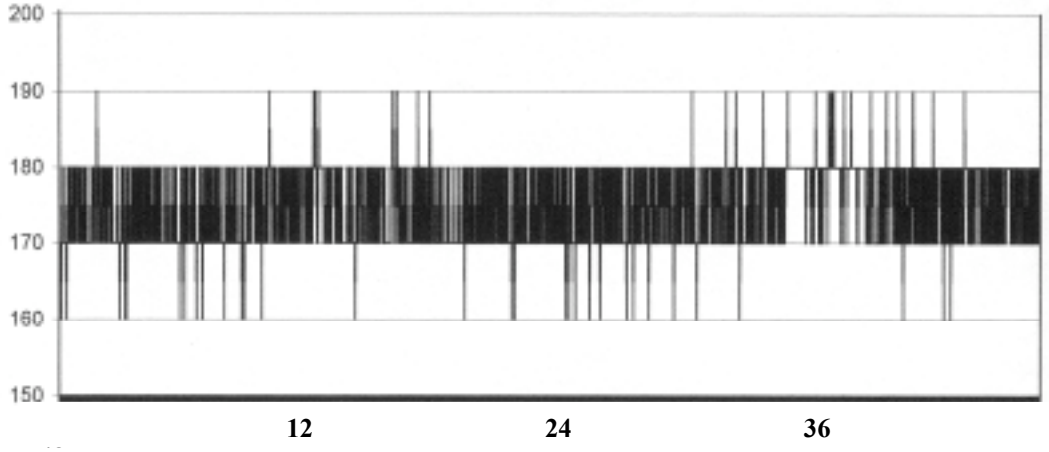


The Phytotron is working with Conviron (Controlled Environments, Winnipeg) to evaluate a new T12 fluorescent tube (96") which is being produced by Philips. The F96/T12/41U/VHO/ALTO tubes may be used in existing VHO sockets and ballast installations thus making them practical retrofits for existing facilities.
Philips product literature indicates that the ALTO tubes have almost 50% more design lumens (16,100 lumens), a higher lumen maintenance (93%) and considerably longer lifetime (12,000 hours) than standard CW-VHO tubes. Purchase cost for the Philips ALTO tubes are approximately 3 times higher than standard VHO tubes.
Initial light measurements in a Conviron PGW36 M10 (high light) growth chamber are presented here. We found the Philips ALTO tubes produced between 18 – 22% more light than our standard Sylvania VHO tubes (at 100 hours). Early data concerning lumen maintenance was equally impressive. Light intensity decay over the first 400 hours was <1% for the ALTO tubes compared to 5.2% for the Sylvania tubes. The Phytotron will evaluate the long term performance of these tubes under working conditions and will assess any adverse plant responses to this new light source.

Sub-Ambient CO_2 Control

At the NCR-101-UK CEUG conference in September 2001, we presented a methodology paper on the control of CO_2 levels within growth chambers. Following that conference, we retrofit 2 reach-in chambers (15 ft^2) and began a series of experiments involving algae under sub-ambient CO_2 levels. Using our methodology, we succeeded in progressively lowering and maintaining CO_2 levels as low as 170 _mol·mol^{-1}. A typical plot of CO_2 concentrations recorded during the study is presented in the graph below. For more information on CO_2 methodology, consult the conference publication cited below. (Romer 2002) .

CO_2 concentration measured over 48 hours in a 2 m^3 growth chamber (Conviron E15)
(Setpoint: 170 _mol·mol^{-1}, Mean: 174.9 _mol·mol^{-1}, SD: 5.5 , n = 2880)



Publications

Romer, M. 2002. Carbon Dioxide Within Controlled Environments; The Commonly Neglected Variable. Proceedings of the 2001 International Conference "Controlled Environments in the New Millenium". The John Innes Centre, Norwich, United Kingdom, 9th - 12th September, 2001. Internet site < http://www.ncr101.duke.edu/>

Romer, M., C. Cooney & F. Scopelleti. 2000. Growth Chamber Maintenance Protocols. In: Phytotronics for Agricultural Research. K.V. Prabhu & P. Chandra (Eds.), National Phytotron Facility, Indian Agricultural Research Institute, New Delhi, India. 206 pp.