NCERA-101: Committee on Controlled Environment Technology and Use
2013 Station Report - McGill University Phytotron

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New Facilities and Equipment

The McGill University Phytotron has acquired two high throughput plant imaging systems (LemnaTec GmbH) to permit the rapid, repeated and non-destructive measurement of plant phenotypic characteristics. The HTS (*High Throughput System*) is designed for analysis of small plants, seedlings and cultures with a maximum capacity of 6912 seedlings per run (72 x 96 well plates). The 3D Scanalyzer utilizes a Bosch conveyor system and permits automated imaging of potted plants up to a maximum height of 90cm and width of 60cm. The systems are equipped with standard imaging, infra-red, 3D laser and fluorescence cameras which will be used for a wide variety of applications:

- Near Infrared Scanning for water distribution (typically used in drought stress testing)
- Infrared Scanning (quantifying temperature differences between leaves and plants)
- Fluorescence measurements between 520 and 750 nm (chlorophyll content & GFP)
- RGB scanning for plant architecture and leaf area measurements.
- 3D laser scanning for ancillary plant architecture including height scanning on small plants with a resolution down to 0.2mm. (HTS)

These units have been funded by a CFI grant to Dr. Tom Bureau and the McGill VEGI Project <http://biology.mcgill.ca/vegi/index.html > and will be used in the discovery of functionally and agronomically important regions within the so-called non-coding regions of plant genomes.

Accomplishments

The McGill Phytotron has completed 25 years of service to the plant research community within McGill University and Quebec. The Phytotron continues to have a high occupancy with usage at 96% of capacity for the 37 growth chambers and 79% for the 10 greenhouse compartments.

Impacts

We anticipate that the acquisition of 2 LemnaTec plant imaging systems will assist the McGill VEGI Project in the identification of non-coding DNA regions that will have proven potential for crop improvement. The VEGI project will also generate valuable data, expertise and trained personnel that will provide the basis for future crop-improvement applications.

Selected Publications for 2012

Souther, S, MJ Lechowicz & J McGraw. 2012. Experimental test for adaptive differentiation of American ginseng (*Panax quinquefolius L.*) populations to temperature. *Annals of Botany* 110: 829-837.

Low-Décarie, E., G.F. Fussmann & G. Bell. 2011. The effect of elevated CO2 on growth and competition in experimental phytoplankton communities. Global Change Biology 17, 2525-2535

Low-Décarie, E., M. Jewell, G.F. Fussmann & G. Bell. Long-term culture at elevated CO2 fails to evoke specific adaptation in seven phytoplankton species. Accepted, Proceedings of the Royal Society B

Lindo, Z., Whiteley, J., and Gonzalez, A. 2012. Traits Explain Community Disassembly and Trophic Contraction Following Experimental Environmental Change. Global Change Biology 18, 2448-2457

Zoé Joly-Lopez, Ewa Forczek, Douglas R. Hoen, Nikoleta Juretic, and Thomas E. Bureau. (2012. A Gene Family Derived from Transposable Elements during Early Angiosperm Evolution Has Reproductive Fitness Benefits in *Arabidopsis thaliana*. PLoS Genetics 8: e1002931

Gaborieau, L., Brown, G.G. 2011. Positional Cloning in *Brassica napus*: Strategies for Circumventing Genome Complexity in a Polyploid Plant. In: *Molecular Cloning - Selected Applications in Medicine and Biology*, Brown, G.G. ed., InTech publishers.

Herman, A., Busch J. W., and Schoen, D. J. 2012. Phylogeny of Leavenworthia S-alleles suggests unidirectional mating system evolution and enhanced positive selection following and ancient population bottleneck. Evolution 66:1849-1861.