2017 NCERA-101 STATION REPORT

Controlled Environment Systems Research Facility

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New Facilities and Equipment.

- A new 'WhiteBox' growth chamber was added to our collection and now houses four 600 x 2400 mm benches of 7 channel multispectral and addressable LEDs (UV through far red) as well as four 400 x 2600 mm benches of fixed wavelength purple and green Intravision Blade LEDs.
- The ion specific optrode system has seen continued development and is now reduced in size, with operation controlled by a Raspberry Pi with touch screen interface. The system has been field tested in Chile and will soon see implementation in the EDEN ISS Antarctic greenhouse.
- In collaboration with PlantForm Corporation, plant infiltration equipment has been installed and is used for vector insertion and therapeutic cancer drug production.
- A prototype whole plant photosynthesis chamber equipped with seven-channel multispectral LEDs was acquired and installed.
- Additional Ocean Optics spectrometers were acquired.

Unique Plant Responses.

Although still to be fully investigated, early testing of plant response to different light spectra has shown an enhancement in photosynthesis in response to UVA in some species.

The addition of UVA light to CEA production of quinoa seedlings improved field transplant success and yield at harvest.

Accomplishment Summaries.

***Technology transfer*:** Current CEA technologies were incorporated in a transportable (not a shipping container!) plant production system design for Modular Farms Co, a company specializing in containerized farming systems with the goal of local sustainable production of salad crops.

The in situ stem psychrometer for measuring plant water status non-destructively with 10 min temporal resolution has been joined by a leaf psychrometer version and both are licensed to ICT International Pty. Ltd. in Australia. Ongoing field trials in tree nurseries and controlled environment cannabis production have yielded fine tuning of irrigation management for these commodities.

Since our last report, a modular three level plant production system equipped with five channel addressable LEDs was developed for the Kuwait Institute for Scientific Research. A follow up project will see the construction of a pilot facility to intensify the study of controlled environment agriculture as a means to improve food security in desert areas.

***Technology advancement*:** A smaller and more cost effective next generation whole plant photosynthesis system (Phridge - Model PS1000) based on "Guelph BlueBox Technology" was developed in collaboration with CONVIRON and Intravision Light Systems. The growth chamber allows real time measurement of whole plant photosynthesis and evapotranspiration while maintaining precise control over temperature, VPD, CO_2 and light (7 channel addressable LED with UVA to far red). The first five systems will be installed in 2017 in a specialized research lab at a medicinal marijuana facility in ON, Canada to more closely investigate the effect of light spectrum on product growth and development and quality of secondary metabolites.

***Communication*:** Tomatosphere®, an educational outreach project that involves thousands of classrooms across North America, is in its 16th year. The program has been licensed by 'Let's Talk Science' in Canada and 'First the Seed Foundation' in the US; two not-for-profit organizations that excel at delivering STEM programs to preschool through Grade 12 students. Treatment seeds for the next round of classroom experiments are currently onboard ISS awaiting the return trip to Earth.

Zheng Y. LEDs: How can they work for you? A webinar invited and organized by Greenhouse Canada Magazine and presented for the whole world. Sept 17, 2015. (Over 300 participants).

Published Written Works

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