Heliospectra
2018 NCERA-101 Station Report

1. New Facilities and Equipment.
The Heliospectra Plant Lab in Gothenburg, Sweden consists of 80m^2 of controlled environment plant growth rooms and one Conviron A1000 climate chamber.

Plant scientists conduct in-house light strategy research and commercial crop trials to support customer LED light installations across six continents using Heliospectra's RX (tunable research top lighting), LX (tunable commercial top lighting) and E (fixed spectra top lighting) series LED lamps. The Plant Lab also supports the development and QA testing of prototype Heliospectra light bars and fixtures prior to commercial release.

As of January 2018, all tunable lamps in the Heliospectra Plant Lab are now controlled by the company's new HelioCORE™ light control software system, integrating Li-Cor Quantum sensors and the HelioCORE DLI controller, On Target PPFD and Schedule controller modules.

In 2018, Heliospectra expanded our research collaboration with Chalmers University on spectral light sensing to include a new focus on image recognition and crop control parameters.

2. Unique Plant Responses.
Ongoing commercial crop research is structured to customers' specific cultivation and business objectives, identifying the impact of individual light wavelengths, schedules and controls on desired plant characteristics, crop performance and finished quality of lettuces, microgreens, herbs, ornamentals, tomatoes and medicinal cannabis.

3. Accomplishment Summaries.
Heliospectra secured funding in 2017 from the European Agricultural Fund for Rural Development in collaboration with Hushållningssällskapet, Swedish University of Agricultural Sciences (SLU) and Research Institutes of Sweden (RISE) for a research project on year-round greenhouse cultivation of Swedish strawberries. Sensory and nutritional analysis will determine the impact of supplemental lighting and spectra composition on the taste, aroma and color of fruit.

Heliospectra began work with Dr. Youbin Zheng and his research associate David Llewellyn at the University of Guelph on a LED control system. The initial 2017 study investigated cut gerbera production under threshold-controlled HPS with intelligently controlled LED using the Heliospectra HelioCORE™ feedback-controlled system to manage multichannel intelligent LED grow lights. The LED control strategies demonstrate opportunity to enhance crop productivity by attenuating fluctuations in DLI and canopy-level PPFD while simultaneously minimizing energy cost by 15%.

During the first quarter of 2018, three Heliospectra customer facilities were also installed as beta sites for the HelioCORE light control system to document consistency in crop quality, real-time dynamic response of supplemental lighting based on changes in local weather and environmental conditions, and the potential for commercial growers to accelerate harvest cycles. Customers sites include:

- John Innes Research Centre with supplemental lighting and control for glasshouse in Norwich, United Kingdom.

- Greenbelt Microgreens with supplemental lighting and control for greenhouse in Hamilton, Ontario, Canada.

- The Grove Nevada with sole-source lighting for indoor vertical cultivation in Las Vegas, Nevada, United States.

4. Impact Statements.

Heliospectra collaborates with leading research institutions, scientific agencies and commercial growers to further the technical development, knowledge transfer and market adoption of LED lighting technologies and light control systems. Heliospectra's customer applications identify opportunity for businesses to standardize yields year-round, ensure highest quality crops and maintain consistent nutritional profiles while reducing the energy demand of controlled environment agriculture and facilities between 15% and 40%.

Published Written Works:

Referred Journal Articles

Ahlman, Linnéa, Daniel Bånkestad, and Torsten Wik. November 2017 Using chlorophyll a fluorescence gains to optimize LED light spectrum for short term photosynthesis. Computers and Electronics in Agriculture 142:224-234 DOI: 10.1016/j.compag.2017.07.023.

Poster Presentations

Llewellyn, David, Johan Lindqvist, and Youbin Zheng. 2018 How intelligently controlled LEDs can be used to more efficiently manage supplemental lighting in greenhouse production systems. Upcoming IHS2018 Innovation and New Technologies in Protected Cultivation, 3rd International Symposium (poster presentation).

Other Creative Works and Collaborations

Llewellyn, David, and Youbin Zheng. October 2017 Developing a feedback control LED lighting system for greenhouse crops. Canadian Greenhouse Conference (session presentation).

Watson, Amy, Sreya Ghosh, Matthew J. Williams, William S. Cuddy, James Simmonds, María-Dolores Rey, M. Asyraf Md Hatta, Alison Hinchliffe, Andrew Steed, Daniel Reynolds, Nikolai M. Adamski, Andy Breakspear, Andrey Korolev, Tracey Rayner, Laura E. Dixon, Adnan Riaz, William Martin, Merrill Ryan, David Edwards, Jacqueline Batley, Harsh Raman, Jeremy Carter, Christian Rogers, Claire Domoney, Graham Moore, Wendy Harwood,
Paul Nicholson, Mark J. Dieters, Ian H. DeLacy, Ji Zhou, Cristobal Uauy, Scott A. Boden, Robert F. Park, Brande B. H. Wulff, and Lee T. Hickey. January 2018. Speed breeding is a powerful tool to accelerate crop research and breeding. Nature Plants volume 4, pages 23–29 doi:10.1038/s41477-017-0083-8.