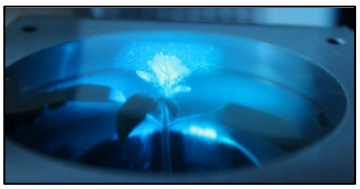

LIGHT EMITTING DIODES: REFINING A TOOL FOR PLANT RESPONSE ANALYSES AND IMPROVED PLANT PERFORMANCE

Oral Defence by PhD Candidate Bo-Sen Wu

Bioresource Engineering

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Abstract

Light emitting diode (LED) technology benefits the horticultural industry in numerous ways. However, questions surrounding LED performance for plant cultivation (photosynthetic and photomorphogenic responses), reliability in operation, and eye safety have not yet been determined. This dissertation addresses these questions from the perspective of an LED user and the plant, with an emphasis on the spectral quality of photosynthesis with 1-nm resolution. Findings from this study demonstrated the spectral photosynthetic curves had two distinct peaks at 430 nm and 650 nm, and shoulders at 480 nm and 595 nm, which implied that major pigments might not be just used to funnel light energy in photosynthetic machinery. Furthermore, the photodamage efficiency of photosystem II (PSII) provides indirect evidence of a link between 595-nm light and oxygen-evolving complex (OEC) involvement in photosynthesis, suggesting that OEC initiates the use of photosynthetic machinery in the presence of 595-nm light. Together, these data imply that the current understanding of photosynthetic activity in plants, previously based on extracted pigment data, is not completely accurate, setting precedence for future experiments aimed at understanding the insight of photosynthesis.

About the Candidate

Bo-Sen completed his master's degree in environmental engineering at National Chiao Tung University in Taiwan. After working on air-born nanoparticle measurement and control, he joined Dr. Lefsrud' lab pursuing his PhD, which focuses on plant lighting.