ANSI/ASABE S642 SEP2018
Recommended Methods for Measurement and Testing of LED Products for Plant Growth and Development

American Society of Agricultural and Biological Engineers

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Introduction

Plant growth and development is dependent on photon (or radiant) flux, photon (or radiant) flux density, photoperiod, and spectral power distribution of electromagnetic radiation. Horticulturalists have traditionally leveraged different intensities and exposure times of fluorescent or HID light sources to control the growth rate of their plants.

As different types of plants react differently to the spectral output and photon (or radiant) flux output of the electrical light source, the use of solid-state lighting (SSL) in the horticultural arena can be seen as a potential benefit for the industry. Solid state lighting (SSL) provides the opportunity to deliver radiation with specific spectral power distributions in accordance with the plants' needs.

Although standards such as IES LM-79-08 exist today to specify the spectral radiation measurements of light sources, they are not specific to SSL horticultural applications. They do not, for example, take into consideration environmental conditions. Further, standards such as IES LM-79-08 are based on the perception of light by the human eye, while this standard is intended to address the plant's response to electromagnetic radiation.

The intent of this standard is to leverage existing standards and provide additional guidance suitable for solid-state radiation for plant growth and development. This includes measured quantities, measurement uncertainty, instrument type, etc. This document describes methods of measurement for different product types. The testing of all quantities outlined in this standard for each defined device is not necessary.

During the development of this standard, concerns were expressed as to the long-term behavior of LED products due to biological and chemical exposure. Since there are insufficient data on the subject and no relevant industry standards have yet been developed, this topic is not covered in the present version of this document, and remains open for consideration in future versions.

During the development of this standard, concerns were also expressed as to the measurement of irradiance in horticultural lighting applications. Since there are limited standards that adequately address how to test for these measurements for horticultural applications, this topic is not covered in the present version of this document and remains open for consideration in future versions.

1 Scope

This document describes methods for measurement and testing of LED packages and arrays or modules, LED lamps, and any other LED optical radiation devices, with a spectral range between 280 nm and 800 nm, used for plant growth and development. These methods are necessary to obtain information about device characteristics and long-term change behaviors.