LEDs shine in bedding plant production study

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Growers of annual bedding plant seedlings or plugs work to produce compact, fully rooted transplants with a large stem diameter and high root dry mass—qualities that make seedlings less susceptible to damage during shipping and transplant. To achieve these desirable qualities, greenhouse growers in northern latitudes must rely on supplemental lighting from high-pressure sodium lamps during winter months. A new study shows that light-emitting diodes (LEDs) can give greenhouse growers other lighting options that produce favorable results.

Previously, the only way for producers to substantially increase ambient greenhouse was to provide supplemental lighting from high-intensity discharge lights—most commonly high-pressure sodium (HPS) lamps. HPS lamps have drawbacks, however; they are only about 25% to 30% efficient, and have limited lifespans. Another disadvantage is the high levels of radiant heat energy produced by high-pressure sodium lamps; up to 75% of the energy from HPS lamps that is not converted to light is emitted as radiant heat energy, causing the surface of the lamps to reach temperatures as high as 450°C. To prevent leaves from scorching from exposure to the high heat, plants must be separated from the HPS lamps.

Light-emitting diodes (LEDs) can offer growers benefits such as higher energy efficiencies and a longer operating life. To determine whether the use of narrow-spectra high-intensity LEDs is can be a practicable supplemental lighting source for greenhouse grown annual bedding plant seedlings, researchers Wesley Randall and Roberto Lopez from Purdue University designed a series of lighting experiments on plugs of

Antirrhinum, Catharanthus, Celosia, Impatiens, Pelargonium, Petunia, Tagetes, Salvia, and Viola.

Results showed that the height of Catharanthus, Celosia, Impatiens, Petunia, Tagetes, Salvia, and Viola was 31%, 29%, 31%, 55%, 20%, 9%, and 35% shorter, respectively, for seedlings grown under 85:15 red:blue LEDs compared with those grown under high-pressure sodium lamps. Stem caliper of Antirrhinum, Pelargonium, and Tagetes was 16%, 8%, and 13% larger, respectively, for seedlings grown under the 85:15 red:blue LEDs compared with seedlings grown under HPS lamps. The quality index was significantly higher for Petunia, Salvia, and Viola under 85:15, 70:30, and 100:0 red:blue LEDs than under HPS lamps, respectively. Overall, the results indicate that seedling quality for the majority of the species tested under supplemental light LEDs providing both red and blue light was similar or higher than those grown under high-pressure sodium lamps.

"Our results indicate that providing supplemental lighting from LEDs or high-pressure sodium lamps has a positive influence on seedling root dry mass, height, and stem caliper leading to high-quality bedding plant seedlings when solar light is limited," Lopez and Randall noted. "A light ratio of 85:15 red:blue light could be a good combination for greenhouse LED supplemental lighting of bedding plant plugs. However, it is important to remember that although blue LEDs have a higher electrical conversion efficiency compared with red LEDs, blue light is a higher energy light, which increases energy consumption as higher proportions of blue are used."

More information: The complete study and abstract are available on the ASHS HortScience electronic journal web site: hortsci.ashspublications.org/c … nt/49/5/589.abstract

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