End-of-production LED lighting increases red pigmentation in lettuce

July 29 2015

Growing vegetables in greenhouses extends crop production seasons in northern latitudes, but the greenhouse environment is far from ideal for providing plants with optimal photosynthetic light. In fact, available photosynthetic daily light in greenhouses can be reduced by up to 50% or more by the structures' glazing material, superstructure, and shading. In northern latitudes, low light is considered the most limiting environmental factor in greenhouse vegetable production.

For example, low light levels can result in the formation of loose heads and low fresh weight of lettuce, and are also attributed to reduced anthocyanin (pigments that act as potent antioxidants and antibacterial agents) content of some lettuce cultivars. "Under low-light greenhouse conditions, such as those found in northern latitudes, foliage of red leaf lettuce varieties is often green and not visually appealing to consumers," explained W. Garrett Owen and Roberto G. Lopez, authors of a new study. Looking for effective methods of increasing lettuce market value while retaining quality, the researchers performed experiments to quantify the effect of end-of-production (EOP) supplemental lighting (SL) of different sources and intensities on foliage color of four red leaf lettuce varieties. Their results appeared in the May 2015 issue of *HortScience*.

The researchers finished lettuce plants under greenhouse ambient solar light and provided them with 16-hours of day-extension lighting from low intensity light-emitting diodes (LED) lamps or SL from high-pressure sodium lamps or LED arrays. Their analyses showed that EOP

SL (light quality and intensity) and days of exposure significantly influenced a change in leaf color and intensity for all lettuce varieties in the study. Relative chlorophyll content and foliage L* (lightness), and chromametric a* (change from green to red) and b* (change from yellow to blue) values were significantly influenced by EOP SL and days of exposure.

"We selected a range of red leaf lettuce that varied in color, from dark vivid red to candy-apple red, and leaf morphologies for this study," Owen and Lopez explained. "Regardless of leaf color or morphology, all varieties grown under low ambient greenhouse light developed darker red foliage and had increased relative chlorophyll content after exposure to EOP SL lighting from monochromatic red or blue or 50:50 red:blue LEDs."

"End-of-production supplemental lighting demonstrates an alternative and cost-effective pre-harvest greenhouse practice for lettuce production in northern latitudes," the authors stated. They said the practice can allow growers to manipulate leaf color in 5 to 7 days, thus increasing aesthetic appeal, quality, and market value without negatively affecting growth or morphology. There are economic benefits for growers, too, as they can reduce the number of LEDs needed to supply supplemental lighting for entire crop production cycles.

"Our data also shows that growers can use this practice with commercially available high-intensity LEDs to increase anthocyanin synthesis and pigmentation of their lettuce crops," Lopez and Owen noted.

More information: The complete study and abstract are available on the ASHS HortScience electronic journal web site: hortsci.ashspublications.org/c … nt/50/5/676.abstract

Provided by American Society for Horticultural Science