Blue light irradiation promotes growth, increases antioxidants in lettuce seedlings

December 12 2011

The quality of agricultural seedlings is important to crop growth and yield after transplantation. Good quality seedlings exhibit characteristics such as thick stems, thick leaves, dark green leaves, and large white roots. Scientists have long known that plant development and physiology are strongly influenced by the light spectrum, which affects seedling structure. Raising seedlings irradiated with blue light has been shown to increase crop yield after planting because of the high accumulation of phenolic compounds. Although most studies with blue light only or blue mixed with red light have indicated that blue light-containing irradiation produces higher plant biomass, recent research has suggested that yield and crop quality could be improved by controlling light quality.

Researchers from Japan's Central Research Institute of Electric Power Industry premiered a study in HortScience that determined the effects of raising seedlings with different light spectra—such as with blue, red, and blue + red LED lights—on seedling quality and yield of red leaf lettuce plants. Photosynthetic pigments, polyphenols, and antioxidant activity of lettuce seedlings treated with different light spectra were also determined.

The team performed experiments in which pregerminated seeds of red leaf lettuce were subjected to various light treatments using blue and red light for one week. At the end of the light treatment (17 days after sowing), the leaf area and shoot fresh weight of the lettuce seedlings treated with red light increased by 33% and 25%, respectively, and the dry weight of the shoots and roots of the lettuce seedlings treated with

blue-containing LED lights increased by greater than 29% and greater than 83% compared with seedlings grown under a white fluorescent lamp. The shoot/root ratio and specific leaf area of plants irradiated with blue-containing LED lights decreased.

At 45 days after sowing (DAS), higher leaf areas and shoot fresh weight were obtained in lettuce plants treated with blue-containing LED lights. "The total chlorophyll contents in lettuce plants treated with blue-containing and red lights were less than that of lettuce plants treated with florescent light; the chlorophyll a/b ratio and carotenoid content increased under blue-containing LED lights", the researchers wrote. Polyphenol contents and the total antioxidant status were greater in lettuce seedlings treated with blue-containing LED lights than in those treated with florescent light at 17 DAS.

The scientists concluded that raising seedlings treated with blue light promoted the growth of lettuce plants after transplanting. "This is likely because of high shoot and root biomasses, a high content of photosynthetic pigments, and high antioxidant activities in the lettuce seedlings before transplanting. The compact morphology of lettuce seedlings treated with blue LED light would be also useful for transplanting", noted corresponding author Kazuhiro Shoji.

More information: The complete study and abstract are available on the ASHS *HortScience* electronic journal web site: hortsci.ashspublications.org/c … /abstract/45/12/1809

Provided by American Society for Horticultural Science

irradiation-growth-antioxidants-lettuce.html