Artificial light quality affects herbivore preference for seedlings

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In horticultural production, growers often depend on systems that use artificial light to produce high-quality transplants. Although the systems are efficient, fluorescent lamps can produce plants with shorter shoots than those grown under natural light. Studies have indicated that this reduced shoot elongation is due to the high red:far red ratio of typical commercial fluorescent lamps, which emit little far red irradiation.

In natural environments a reduction in the red:far red (R:FR) ratio resulting from the absorption of red light by neighboring vegetation increases shoot elongation and leaf expansion and reduces leaf thickness and chlorophyll content. This morphologic response, called "shade avoidance", reduces plant resistance to herbivores. Observing this phenomenon, scientists questioned whether illumination by fluorescent lamps with higher-than-natural R:FR ratio could lessen plants' attractiveness to herbivores, thus reducing the need for pesticides at transplant.

Researchers in Japan tested the hypothesis with experiments that evaluated the preference of adult sweetpotato whitefly to cucumber seedlings grown under commercial fluorescent lamps or under metal-halide lamps that provided a spectrum similar to that of natural light. The results were published in *HortTechnology*.

Cucumber seedlings (Cucumis sativus) were grown under fluorescent lamps (FL) or under metal-halide lamps (ML) in a 12/12-hour light/dark cycle. The red:far red (R:FR) ratio of FL was 7.0 and that of ML was

1.2. Pairs of cucumber seedlings, one grown under FLs and the other under MLs, were then placed in cages and about 100 sweetpotato whitefly adults (Bemisia tabaci biotype B) were released. "There were significantly fewer whitefly adults on the cucumber seedlings grown under fluorescent lamps (36%) than on those grown under metal-halide lamps (64%) 24 hours after release", reported corresponding author Toshio Shibuya. "Additionally, FL cucumber seedlings had higher chlorophyll content and thicker leaves than ML seedlings."

"From these results, we concluded that the lower attractiveness of FL cucumber seedlings to adult sweetpotato whiteflies was probably due to changes in leaf morphologic characteristics resulting from high R:FR light of FL. The plants with lower attractiveness are possibly more resistant to herbivores", said Shibuya.

The scientists noted that growers must consider the interaction of other environmental factors such as air moisture in order to apply the results to horticultural production. They added that experiments designed to measure adult sweetpotato whitefly landing response in a no-choice situation would be necessary to further evaluate the light technology.

"The fact that light quality affects the plant attractiveness to herbivores should be considered in selecting light sources for transplant production under artificial light", concluded the researchers.

More information: horttech.ashspublications.org/ … nt/abstract/20/5/873

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