By Erik Runkle

Greenhouse Shading Options

As spring approaches and days get gradually longer, growers need to look at ways to limit the light and heat that affect their most sensitive crops.

Light has been a limiting factor in the production of greenhouse crops for many growers in the past several months. Now that spring is upon us, the days are getting longer, and the intensity of light from the sun is also increasing. Growers in the South are already receiving high quantities of light and warmer greenhouse temperatures. Many growers in the South typically provide shading beginning in April, while growers in the North often wait until sometime in May.

Shading is applied primarily to limit the temperature rise in the greenhouse. Most shade-avoiding (full-sun) crops can tolerate high light levels just fine. However, the amount of energy that comes from the sun is high from late spring until early autumn. This energy increases air and plant temperature, and as a result, the quality of some crops can decline when temperature is excessively high. In addition, photosynthesis becomes maximal for many high light greenhouse crops at about half the intensity of full sunlight. Therefore, the extra light simply is not needed. Finally, shading diffuses the light inside a greenhouse, making bright areas dimmer and shaded areas brighter.

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Two Possible Approaches

There are two general strategies used to provide shading to greenhouses: application of a shading compound such as whitewash and installation of a retractable shade curtain. Shading compounds are commonly used because they are relatively inexpensive to apply, can be used on any glazing material and structure, and reflect light outside the greenhouse before it enters and increases temperature. The major disadvantage of a shading compound is that the shading is somewhat constant and present even when shading is not needed, such as on cloudy days. In addition, the shading percentage of traditional whitewash products can decrease during the year as it slowly dissolves with rainfall.

A retractable shade curtain can be installed inside the greenhouse above the crop or, less commonly, outside the greenhouse structure. When a curtain is located inside, solar energy is allowed to enter the greenhouse before it is reflected. This can cause heat to build above the shading material, which increases the need for roof vents. Although shade curtains are relatively expensive, they allow light to be more precisely controlled, which can improve crop quality. The ability to retract screens during periods of low light is an important attribute of this technology.

Energy-Saving Properties

Another important use of a shade curtain is to function as an energy curtain. A good energy-saving curtain has a closed construction, meaning that air does not readily pass through. However, a curtain with a closed design can be undesirable when serving as a shade curtain because it does not allow warm air under the curtain to escape in the summer. For a company that produces year round, a two-curtain system is ideal: an open-weave curtain to modulate light, and a solid curtain to serve as an energy curtain. A two-curtain system optimizes light during the day and can achieve significant energy savings at night.

In general, a goal of shading is to prevent light intensities from exceeding 4,000 to 5,000 foot-candles (about 800 to 1,000 $\mu mol \cdot m^{-2} \cdot s^{-1}$) at plant level. Therefore, for many high-light crops, the shading percentage should be about 40 percent, and perhaps slightly higher (50 percent) for glass greenhouses. When light becomes limited once again in the autumn, shading compounds should be completely washed off so that crop quality is not marginalized. GPN

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