

UV-Transmitting Greenhouse Glazing

Materials used to glaze greenhouses and hoopouses have different transmission properties, including ultraviolet (UV) radiation. Approximately 4% of the sun's radiation output is as UV, but since the ozone layer absorbs most UV-B (280-315 nm) and all UV-C (100-280 nm) radiation, about 95% of the UV we receive is UV-A (315-400 nm).

To increase material longevity, most glazing plastics contain chemicals that absorb UV radiation, which is then dissipated as low-level heat. However, these UV stabilizers degrade over time and thus, UV transmission increases as the materials age. In contrast, regular greenhouse glass transmission is stable, with roughly 70% of UV-A and around 3% of UV-B passing through it.

There are also glasses and plastics that can be used for greenhouse glazing that transmit UV-B and/or UV-A.

For example, UV transmits through the plastic ethylene tetrafluoroethylene (ETFE) but does not degrade it. There are also acrylic products that transmit UV without negatively influencing its longevity. While

there have been relatively few published horticultural studies on the use of UV-transmitting greenhouse glazing materials, there are some probable benefits as well as potential drawbacks.

PLANT RESPONSE

UV-A and especially UV-B cause a number of plant responses, although the magnitude depends on the crop. In addition, UV radiation typically elicits stronger crop effects when the average daily light integral is low and/or when the temperature is not high. Some of the common plant responses to UV include:

- Inhibition of extension growth; leaves are smaller and thicker, and stems are shorter
- Increased coloration of green and especially purple leaves
- Sometimes a small decrease in leaf number
- Increased stress tolerance and thus, possibly better performance during shipping and at retail
- Improved performance once plants are transplanted outdoors
- Increased nutrition and concentration of bioactive compounds in food crops

- Stronger flavor of edibles — although not always in a positive way. For example, lettuce may taste bitter.

Therefore, plants grown under greenhouse glazing that transmits UV radiation are typically more compact, darker in color and more resilient. Vegetables and other food crops can contain more vitamins and health-promoting compounds. Effects are typically greater under materials that transmit UV-A and UV-B, compared to UV-A alone.

EFFECTS OF UV RADIATION

Transmission of UV radiation into the greenhouse can have positive and negative effects on beneficial insects including parasitoids and pollinators, as well as insect pests. Insects use UV for navigation and orientation. Studies have shown that migration of insects into greenhouses decreases when

glazing materials contain UV-blocking compounds. Therefore, transmission of UV into the greenhouse could increase insect pest activity (e.g., aphids, thrips and whiteflies) once inside. However, plants under UV often produce higher concentrations of defensive or secondary compounds that consequently inhibit insect pest feeding.

Similarly, transmission of UV through glazing materials can have variable effects on plant

pathogens. A large number of studies report that UV-A and especially UV-B exposure kills spores of many different fungal species. However, there are exceptions; for some pathogens, UV-A can stimulate sporulation. Therefore, while a glazing material that transmits UV radiation can reduce disease pressure, there are exceptions, and the magnitude depends on a number of factors.

In addition to cost, there are a few additional factors to consider about UV-transmitting glazing materials. First, UV inside the greenhouse will hasten degradation of plastics, such as irrigation lines. In addition, workers inside the greenhouse need protection from the UV radiation (especially for UV-B transmitting materials), such as wearing long sleeves, sunscreen, hats and sunglasses. [gpn](#)

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