The Availability of Light Energy for Plants Grown in Greenhouses

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Most greenhouse cover transmission data, utilized by industry and researchers, are based on the percent of artificial light transmitted by a particular material in the laboratory. It is generally accepted that greenhouse glass is capable of transmitting approximately 90 percent of the light energy falling on it and the Fiberglass Reinforced Plastic (FRP) panel industry indicates that 70-90 percent is transmitted through their product.

The light transmission characteristics of any greenhouse covering are important, but of greater importance is the percent of useable energy available to the greatest area of plant leaf surface. Preliminary studies at Colorado State University indicate that less than 60 percent of unobscured solar energy is available for plant growth in greenhouses covered with glass and FRP panels during winter months.

In the CSU study, Sol-A-Meter Mark II pyranometers, which responded from 350 to 1150 millimicrons, peaking at 850, were placed at plant height in the center of a glass and FRP covered greenhouse oriented east and west. The insolation transmitted through each cover was recorded. The relationship of the resulting transmission curves to that of incoming light energy is shown in Figure 1.

Discussion

The narrow dips in curve A, obtained under a glass cover, were caused by the sash bars and the broader ones by two truss units. Curve C was obtained in an identical house covered with clear FRP. No bars were present, but the trusses were in the same locations. The diffusing characteristics of the FRP cover eliminated the shadows created by the trusses. The data indicate 58.1 percent of the available solar energy reached the plants grown in the glass house. Only 49.2 percent of the same potential energy was available in the FRP covered house.

The available energy under each cover increases during summer months, but the transmission differences probably do not change. Even though the energy transmitted by the FRP is less than that in a glass-covered house, the diffused light is available to a greater leaf area; therefore, more plant production. Such a conjecture seems to substantiate earlier reports (1,2).

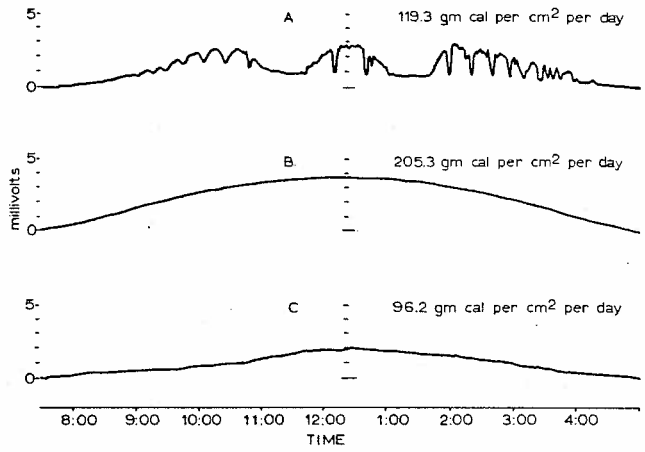

Figure 1. Solar energy curves received under greenhouse coverings of (A) sash bars and glass and (C) FRP clear compared to (B) incoming energy. January 21, 1968.

Literature Cited

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2. Goldsberry, K. L. 1968. Transmissibity of greenhouse coverings as related to carnation growth. Proc. National Agr. Plastics Conf. 8:15-21.

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