Colorado Flower Growers Association, Inc.

IN COOPERATION WITH COLORADO STATE UNIVERSITY
Dorothy Conroy, Executive Secretary
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LIGHT TRANSMISSION OF REFINISHED FIBERGLASS

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During the past six years the majority of new Colorado greenhouses have been covered with some type of corrugated fiberglass. The earliest materials contained a fiberglass mat embedded in polyester resin. After two or three years of weathering it was apparent the material would have to be recoated to prevent "fraying" or "blooming" of the fibers. If "fraying" progressed dust accumulated in the remaining impressions and light intensity was reduced. These fiberglass coverings also developed a yellowish color. This color change was apparently due to the accumulation of dust and perhaps to some degree a reaction caused by heat or some phase of the light spectrum.

The advent of acrylic modified materials has increased the longevity of most fiberglass coverings. The presence of at least 15 percent acrylic resin has retarded weathering and provided a material that will generally not need recoating for 5-8 years. Some fiberglass manufacturers are applying additional coatings of various types to the surface to provide increased longevity.

Methods and Materials

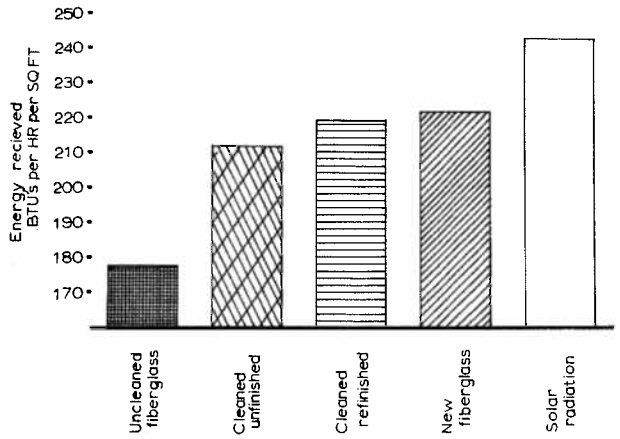
On March 15, 1960, polyester type fiberglass was installed on a greenhouse. Five years and six months later one panel was removed for evaluation. The glass fibers were loose and were 1/2 inch to 3/4 inch long. Dirt was imbedded in the impressions, and the panel appeared very dirty. One third of the panel was not cleaned in any way. Two thirds of the panel was cleaned with a trisodium phosphate solution and scrub brush. All of the remaining loose fibers were removed with coarse steel wool and the panel thoroughly washed with water. After drying, one half of the cleaned panel was recoated with an acrylated refinisher applied by brush.

The percentage of heat and spectral transmission received by the sensing elements under the various panel treatments was compared to natural solar radiation and the amount transmitted through new acrylated material. All data were taken when the sun was at maximum altitude for any day of measurement. Total and diffuse radiation transmitted through the materials was measured with a Sol-A-Meter Mark II pyranometer made by the Yellott Solar Energy Laboratory, Phoenix, Arizona. Measurements were made in Fort Collins, Colorado. The spectral transmission qualities of the treatment panels was measured with a Model SR and SRR Spectroradiometer made by ISCO of Lincoln, Nebraska. These measurements were made in Ames, Iowa.

Results

Figure 1 shows the total amount of radiation (BTU's/hr/ft^2) transmitted through the three panel treatments as compared to the transmission through new acrylated fiberglass and received from unobscured solar radiation. The total heat transfer of the uncleaned section of the panel was 26.8 percent less than the unobstructed solar radiation and 20 percent less than the transmission through new acrylated fiberglass.

Fig. 1. Mean solar radiation received from unobstructed sun and through four fiberglass samples during three one hour periods when the sun was at maximum altitude. Aug. 12, 13, and 15, 1965, Fort Collins, Colorado.

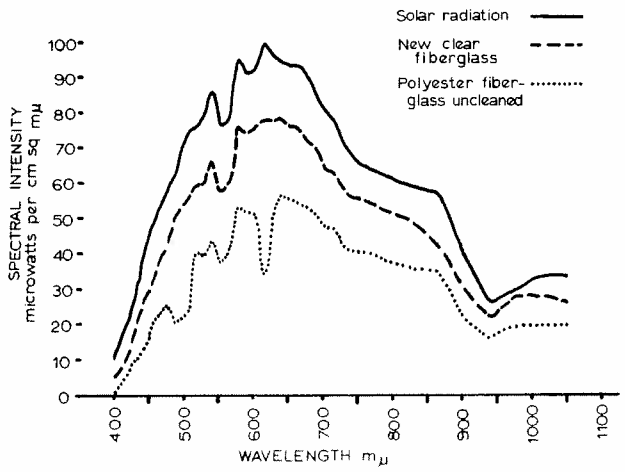


Washing and cleaning with the solution and steel wool increased transmission 14.1 percent over the uncleaned section. Application of refinisher increased transmission another 2.7 percent. The refinished section of panel transmitted 98.5 percent as many BTU's/hr/ft2 as new acrylated fiberglass.

Spectral Transmission

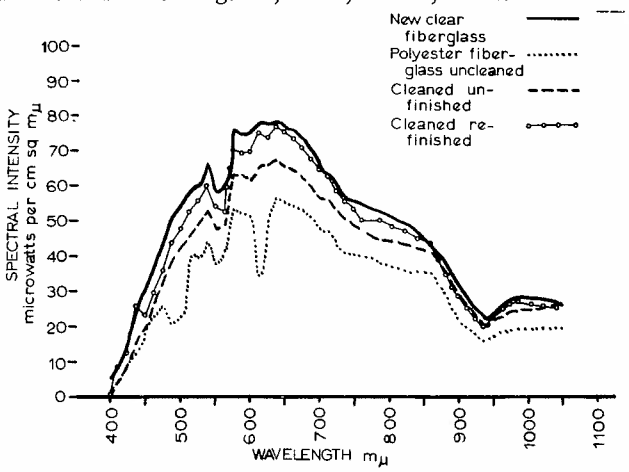
The relationship of spectral intensity and distribution obtained from unobstructed solar radiation, through new acrylated fiberglass, and through weathered (66 months) polyester fiberglass is shown in Figure 2. There was a decrease in over-all spectral transmission from uncleaned polyester fiberglass with definite effects appearing in the 500 mu (millimicrons) and 600 mu areas. The greatest decrease in intensity occurred in the area between 500 and 750 mu.

Fig. 2. Spectral distribution and intensity of weathered polyester fiberglass (66 months), new acrylated fiberglass and solar radiation. Aug. 11, 1966, Ames, Iowa.



When uncleaned polyester fiberglass was washed the spectral transmission increased evenly throughout the area between 450 and 850 mu and the decreased intensities around 500 and 600 mu almost disappeared (Fig. 3). The application of refinisher increased transmission in the range from 650 to 1050 mu to that of new acrylated fiberglass. The transmission from 450 to 650 mu was not increased as effectively. Most of the yellowish color produced in the dirty fiberglass disappeared when the material was washed and refinished.

Fig. 3. Spectral distribution and intensity of weathered polyester fiberglass (66 months) when cleaned and refinished. Aug. 11, 1966, Ames, Iowa.



Discussion

It is evident from these preliminary studies that weathered fiberglass panels can be effectively refinished to provide spectral transmission almost equal to that of new acrylated fiberglass. The slight yellow hue developed in the weathered fiberglass does not greatly affect light transmission when panels are recoated and probably has little or no effect on plant growth.

Several factors should be considered before refinishing:

1. Don't wait until the fibers have completely frayed. Application of a refinisher before an excess of fibers are removed will be advantageous.
2. Use an effective known cleaning compound and rinse well. It would be wise to "spot" test any unknown cleaner before it is used.
3. After rinsing thoroughly make sure the material is dry before applying the refinisher.
4. Apply approved refinishers with an acrylic base. Application should be done on a windless day so that a minimum of dust will be involved. The better refinishers will dry in approximately 15 to 30 minutes.
5. Due to the rapid drying of some refinishers, it

appears that brush application is superior to spray methods.

Research and evaluation of plastic coverings, their durability, transmissivity and refinishing methods will continue at Colorado State University in hopes of obtaining the most desirable covering for plant growth.