

DOUBLE-LAYER OVER THE GLASS¹

The Debate Continued - The System

One of the most effective ways to reduce energy losses from a glass greenhouse is to inflate two sheets of polyethylene over the glass structure. The work done here at the OARDC and by many growers clearly substantiates earlier research that showed a 57% fuel savings when the entire house is covered. Practical grower applications will result in a 40-60% savings. The initial installation costs \$.50 to .60 per square foot of covered area and is equally divided between labor and material costs.

The key component of this system is that the poly be tightly secured to the structural frame of the greenhouse and that the poly remains properly inflated at all times. Other specifics can be obtained by writing for Special Circular 101, titled "Conserving Heat in Glass Greenhouses with Surface-Mounted Air-Inflated Plastic." This circular provides the details of applying the polyethylene to the glass structure. Another installation manual can be obtained from Monsanto Co., 800 North Lindbergh, St. Louis, Missouri 63166, or a local distributor. Monsanto lists some good advice and illustrations for proper installation on a glass greenhouse:

"Monsanto 602 is a versatile plastic material for glass greenhouse owners. In double, air-filled layers, it can be used to cover entire glass house structures or certain parts. For example, if you have interior cooling fans, you may desire to cover walls and roofs right over the vents. If you need operable vents, you can cover up to them. You can cover freestanding units and gutter connected ones. You can employ separate bubbles on walls, and you can work around vents, fan boxes and doors. And you can cover the ends.

Before you decide what part of your house you want covered, you should give some thought to beneficial light exposure, prevailing winds and other weather conditions which might affect your heating costs."

You can insulate free standing houses, or cover gutter-connected houses of virtually any length.

Some growers prefer to use separate wall bubbles over side vents or Aspen pad areas which can be removed when warm weather approaches.

Pros and Cons of Double-Poly Over Glass

The original work on double-poly over glass done by Drs. T.H. Short and W.L. Bauerle at the Ohio Agricultural Research and Development Center with partial support from Monsanto has been well publicized in trade magazines and grower meetings. Additional information is available from Special Circular 101 "Conserving Heat in Glass Greenhouses with Surface-Mounted Air-Inflated

Plastic" by Short and Bauerle or from many suppliers of plastic film.

Savings

A glass compartment totally covered with double-layer, air-inflated poly (sidewalls, roof and vents) used 57% less fuel than a comparable glass compartment during the 1976-77 winter. Because installation is made to the outside, it is relatively easy to install on most greenhouse structures. Original installation costs (materials and labor) range between \$.45- .60 per greenhouse square foot for the greenhouse roof. There is a recurring cost of \$.10-.12 per square foot every two years for poly replacement. Most growers should realize about a 50% savings in fuel when only the roof is covered.

Advantages

In most cases, these advantages far outweigh the disadvantages:

1. An annual fuel savings of 50% for most growers. Generally, the fuel savings the first year will pay for the initial investment.
2. Maintenance of uniform and optimum temperatures even during the coldest nights which improve plant growth.
3. Maintenance of higher CO₂ levels due to less leakage.
4. Higher humidities, if controlled properly, useful for crops where leaf expansion is important (poinsettia bracts and foliage plants).
5. Less shading and cooling required to control summer temperatures. Only "easy off" should be used if shading is necessary at all.
6. Poly over glass distributes snow loads that could normally damage old houses.
7. The least cost-highest return method of revising an old greenhouse in poor repair.

Disadvantages

The following are some of the disadvantages that may or may not be problems for greenhouse growers:

1. The additional poly reduces the light intensity reaching the crops by 15-20%. Light is often limited during the winter and can affect yield and/or quality of crops grown. To overcome low light, the following are recommended:
 - a. Repaint all wood sash bars white.
 - b. Clean all glass before covering with poly.
 - c. Use supplemental CO₂ at 1,000-1,500 ppm during daylight hours.
 - d. Use recommended cultivars and growth regulators to maintain quality.
 - e. Try supplemental lighting.
2. An approximate 10-15% increase in relative humidity may increase disease problems such as botrytis. A good disease prevention program using sprays, fumigants and ventilation should be used.

¹Reprinted from *The Maryland Florist*, No. 220, August 1979.

3. Depletion of CO₂ due to tight covering may reduce crop growth. Supplemental CO₂ should be added.

Precaution

The aluminum poly-lock strips must be securely bolted to the structure. Bad experiences have occurred when growers have used screws or bolts in the sash bar, and high winds have lifted the poly off the structure.

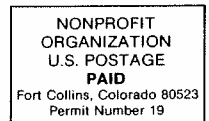
In comparing the other energy conservation systems, the reduction of air infiltration due to the plastic and the

insulation effect of the air inflation makes the double-poly over glass the most economical method available, if reductions in yield and/or quality can be overcome. Some growers are placing double-poly on the north or west exposures and either leaving the rest plain or using a lap sealant. This combination compromises total energy savings but minimizes the light reduction problem.

The double-poly over glass is not the best answer for all growers, but it is a system that should be compared on its own merits and demerits. (From Conserving Energy in Ohio Greenhouses, Horticulture, Ohio State Univ., Nov. 1978 and Jan. 1979.)

Published by
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