S.D.P., INFRARED HEATING, SOIL HEATING*

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The double layer acrylic material that is called S.D.P. in Canada and Acrylite in the United States has become more common over the past five or six years. It was first installed on several cold frames at the Vineland Research Station about 10 years ago but there was not a lot of interest since it had to be imported from Germany making it very expensive.

S.D.P. actually is a short form for "Stegdoppelplatte" and is now made by Chemacryl Plastics in Niagara Falls, Ontario plus CyRO Industries in New Jersey.

It is manufactured in rigid sheets about 4' wide and standard lengths of 8', 10', 12', 14', and 16' or can be custom made to longer lengths to satisfy any roof bar length. The insulation factor (approx. U Value = .55) is due to the two layers being separated about ½" with rigid supports every ½". When calculating the heat loss from a glass house compared to an S.D.P. house, an approximate savings of 40% will be realized. Research from Penn State and Vineland Experimental Station, the manufacturer's claims, and grower's experience all appear to back up this reported savings.

Possible Disadvantages

— the S.D.P. will burn although not anywhere near as fast as fiberglass.
— insurance premiums are higher than glass.
— total light (Photosynthetic Action Radiation — P.A.R.) reaching the crop is equivalent to a new doulbe poly house, i.e. about 5-10% less than glass unless fewer structural members are used.
— the material is such a good insulator that snow tends to melt very slowly causing an extended darkness.
— the S.D.P. does significantly contract and expand so a good quality roofing bar and closure strip must be used.
— the S.D.P. breathes very slowly so condensation will develop between the layers. It is therefore important that adequate drip rails be provided at the bottom ends of the sheets.
— the cost of a finished S.D.P. house is about $3.00 more per greenhouse square foot than a glass house.
— actual material cost is about $2.50 per square foot.
— since snow does not melt rapidly, a stronger than normal greenhouse framework may be desirable. Normal greenhouses are rated at over 15 psi. This material is rated at 150 psi.
— a light loss of an additional 3% was calculated at Vineland in the second year. However, it was felt this was due to condensation and not to product degradation. No further reduction is anticipated.
— higher relative humidity will be experienced in a S.D.P. house, as in other tight houses.

Possible Advantages

— a definite energy savings of 40% over glass.
— generally reduced maintenance costs if installed properly.
— a smaller heat system is needed.
— reduced vandal and physical damage especially when installed on gable ends and sidewalls.

Observations

The majority of the applications for S.D.P. in Ontario is on sidewalls and gables. This would be especially so for light sensitive crops where glass is still preferred. Slowness to melt snow is the other major reason for its limited use on the roof.

The importance of a qualified builder using good materials cannot be stressed enough. It takes a while for a builder to develop an efficiency in working with the acrylic sheeting.

Infrared Heating

Infrared heating offers an alternative to the conventional hot water, steam or forced hot air systems commonly used in Ontario. There are several commercial growers with the infrared either partly or entirely heating their greenhouse ranges.

The cost for installaion is roughly $1.50-$2.00 per greenhouse sq. ft. so it is relatively expensive to install. The 60,000 BTU heaters are usually spaced at 22' centers along the distribution pipe which is set at a height roughly one-half the width of the heating area desired. For example: in a 20' wide house, the heat pipe whould be 10' above the crop for even distribtuion.

The energy savings with infrared over a conventional forced air unit heater with a hot water boiler was 33-41%. This is roughly in line with other research work and grower experiences.

Good quality crops of poinsettias, mums and carnations have been experienced. A recently reported problem was with Easter lilies heated with IR — causing a "palm-tree" effect and short plants. Some growers

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using IR did not experience this problem. Theo Blom at the Vineland Station will be growing some lilies under the IR system for 1981.

Soil Heating

The most efficient place to position heat is directly under the crop since it warms the root zone. As a general recommendation, soil heating lines are ¾"-1" diameter tubylene pipe placed on 20"-24" centers and 20"-24" deep in the ground. The circulated hot water is roughly 90°-100°F for a soil temperature of 70°F. The costs for material installed is roughly 50¢ per sq. ft. of floor area.

The lines can either be "ploughed-in" or set in a trench made by a small ditching machine. It's important to get the pipes evenly deep especially if you use a soil spading machine.

For tomatoes, research work at Vineland found that when air temperature was reduced from the normal 62°F to 50°F and soil was kept at 70°F, the same yield was experienced with a 45% energy savings. *But* temperatures are critical and need to be properly maintained.

At the University of Guelph there has been work with combinations of lower temperatures, soil heating and high pressure sodium lighting. On commercial ("standard") mums for example, air temperature was reduced to 55°F and soil was at 70°F. The varieties "Promenade' and 'Gold Burst Mefo' responded positively whereas 'Improved Mefo' experienced too much delay and some "pinking" of the flower. All three varieties set bud but there definitely is a varietal response to the treatment. In general, the cooler night temperatures produced plants with larger stems and flower diameter than the normal temperatures. Some earlier work reported that soil heating in the early vegetative stage improved crop take-off and quality. A study on roses ('Samantha', 'Gabriella') indicated that soil heating (70°F) and a low night temperature (55°F) improved quality and yield. However, soil heating in conjunction with the HPS lights did not give any added benefit.

Some growers have shifted toward soil heating by placing the heat lines right on the ground between the crops — e.g. roses, carnations or mums and just shifting the lines during soil preparation.

Soil temperature seems best in the 70°F range since, in several experiments, soil temperatures in the 75°F and above range were detrimental to the crop.

The research work in the three main discussion areas is being done by Theo Blom and Frank Ingratta at the Horticultural Research Institute of Ontario at Vineland Station and Jim Tsujita at the Horticulture Science Department, University of Guelph.

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