Dacthal in August, when your Simazine starts wearing off, ought to be practical?

KLAAS VAN HOF: I might possibly be, Pete, but we've had no experience with it and I couldn't comment on it.

JOERG LEISS: Why do you spray over all, if you cultivate in the rows?

KLAAS VAN HOF: Well, I know several nurseries are using band spraying, Mr. Bailey said he used this method, but I can't give you a good reason except to say an overall spray is what we have used and just haven't bothered to change it. I realize that we probably spray about 20 acres, possibly a little more, so the cost is not too different.

MODERATOR SHUGERT: Would Mr. Dugan like to comment on weed control in Ohio?

DAVE DUGAN: I will not have time to hit them all. I don't know why you are using Simazine. That went out three years ago. There are four or five I think you should be trying. We do use Simazine at four pounds. Dacthal is an excellent material, working in Ohio, of course it is made in Ohio. Have you got casoron yet or dymid? Casoron is the one you put on, cultivate it in, plant in it and then go fishing, and this is looking terrific in Ohio. Dymid will take all this grass stuff out and do everything else Simazine will do and Chloro I.P.C. is still good, applied in fall or spring when cool and moist. The whole thing is to add about 10 feet to your herbicide shelf each year. You have to work along with your material, your weeds and your soil type. We were whispering in the back there and we were up to a thousand pounds of Simazine on some rhododendron in complete peat. But don't try that on sand.

MODERATOR SHUGERT: We are now in the last quarter of the afternoon, and our first speaker — who I am pleased and proud to have with us — talking on over wintering and early shipping, is Mr. Leslie Hancock from Woodland Nurseries, Cooksville, Ontario, Canada.

OVERWINTERING AND EARLY SHIPPING

LESLIE HANCOCK
Woodland Nurseries
Cooksville, Ontario

The subject on which I have been listed to speak is somewhat misleading as I am by no means an authority on either over-wintering or early shipping. Nevertheless, I am keenly interested in both, first as a plantsman to bring material readied for sale through the winter in good health, and secondly to get on with the job of distribution well ahead of the time we should be replanting the nursery.

There are many nurserymen who will consider that this problem has been solved, for we already have huge storages where millions of plants are stacked in shingle tow and shipped

to their destination weeks ahead of any chance to have them freshly dig from the open.

The success of these storages from the dollars and cents point of view is conceded, but I remain unconvinced that they are in the best interest of the plants. There have been too many experiences of plants arriving looking normally healthy, yet failing later to leaf out; too many shipments with etiolated white young growth, that have later died en bloc. Though perfectly satisfactory for some lines of stock, such storages are far from suitable for all. I am especially interested in bringing certain broad-leaved evergreens such as Euonymus fortunei varieties, Mahonia, Rhododendron, Pieris, Pyracantha etc. through the winter in first class condition. To achieve this I consider the following points essential.

1. The plants must have light.
2. The roots must either be balled and burlapped or set in soil.
3. The plants must be protected from wind.
4. They must be protected from sudden and violent drops or raises in temperature, but must be subjected to a certain amount of winter freezing. Tempeerature should not fall below 5 degrees F. above zero, (-15 Celcius) or rise above 40 degrees F. for any length of time.
5. Ventillation is imperative in mild thawing weather.
6. Internal conditions must be watched for soil and air humidity. A certain amount of watering is essential.

The old-fashioned winter storage pit with manually operated glass sash provided for all these essentials but the main faults were, (a) too high cost, (b) too restricted storage space and (c) too much manual operation. If we can correct these faults into high storage capacity and less manual operation, we are proceeding in the right direction. To provide these essentials we propose as follows:

1. Use polyethylene to provide light.
2. Retain earth floor for moisture contact and heeling-in ground.
3. Protection from wind to be obtained by retaining the sunken pit idea and perfect sealing against cold air intake obtained by polyethylene.
4. Sunken pit concept also modifies temperature by taking advantage of sub-soil heat. Reduction of the polyethylene to one third the roof area tends to spread the heat intake over three times the floor area. If experience shows it to be necessary, some thermostatically controlled electric heat could be provided for periods of sub-zero temperature.
5. Ventilation to be provided on both sides of the building through two feet of wall space above the outside ground level. These ventilators can be opened manually or automatically.
6. Manual watering by hose to be performed as necessary.

The other critical factor which concerns all of us of course, is cost. Like many others, when polyethylene first came on the market we thought it was going to be an inexpensive cure-all for overcoming the ills of a North American winter. We soon learned differently.

We started with an adaptation of a polyethylene quonset-shaped structure that is used in Canada for the production of early spring garden crops. These pre-fabricated polyethylene units are known as Portagreens and come in standard sections five feet wide and with a spread of eleven feet. We built a 60 foot by 11 foot low wall structure into a bank along the lines of sash covered winter pit, roofed it with twelve sections of the quonset-shaped Portagreens and filled it with the plants needing protection.

We arranged for some ventilation but not enough. When the sun shone on the polyethylene, the temperature inside the building shot up alarmingly. On cold nights, even with everything seal-tight the temperature inside was barely ten degrees F. better than the recorded outside low. We soon realized that if this rapid fluctuation continued throughout the winter our stored plants would be ruined. The polyethylene roof was therefore covered with reed mats to reduce direct sunlight which saved the situation but added considerably to the cost. By opening doors on mild days however, the plants, mostly broad-leaved, came through the winter in good condition.

It was clear that such a shelter, even if planned on a large scale, could not be an economical success, but valuable lessons had been learned. We found that even with the reed mat covering there was still good light within. Hence in our second storage effort, pictures of which will be shown, the same area of polyethylene roof is used for a building three times the size. Also a much more satisfactory arrangement for uniform ventilation has been planned. Stock to be stored can be trucked into the building, and thought it can be faulted as still too small for the operations of a modern nursery, it is as large as one dares to go until the answers have been worked out. Again the question of cost comes up. It was hoped at the beginning that floor space could be provided in this 60′ x 33′ building for an overall cost of $1.50 per square foot. This figure is now more nearly $1.75 per square foot. If we introduce automatic temperature or ventilation controls, the per square foot cost could climb to $2.00 per square foot or higher, which may be considered too high as an inexpensive method of winter protection.

We believe no artificial heating will be necessary for the building, as the heat intake of the polyethylene in March should take the frost out of the interior earlier than it leaves the ground outdoors.

This short paper is merely a progress report on an attempt to provide more natural winter storage, in particular for broad-leaved evergreens. The big problem of course is one of economics. In the past, heated sub-tropical conditions have been sup-

plied in the north at great cost for the housing of tender plants. Far more necessary it seems, is the wintering of many of our normally hardy plants in their early stages of development. Is it not conceivable that some modification of our northern winters is economically possible in the future on a large scale? I feel certain it will be so and that structures will be built to provide all essentials of a controlled modified winter climate.

MODERATOR SHUGERT: Our next speaker is Mr. Bill Cunningham from Waldron, Indiana, who will speak on over-wintering in poly structures.

OVER WINTERING PLANT MATERIALS IN POLY STRUCTURES

W. E. CUNNINGHAM
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In recent years this subject has been discussed at great length by many speakers, and the subject still bears interest because growers are deeply concerned about ways and means of successfully over-wintering container-grown plants. Perhaps my subject should be titled, 'controlling environment in poly structures.'

I hope you will forgive me if I seem rather brusque in this opinion, but I believe the problem of winter-storage of plants in containers is an elementary one. Permit me to say, when plant materials are grown in containers and winter-stored above ground, then subjected to wide temperature extremes, often coupled with high wind, we cannot expect 100% survival every winter. In simple terms, the environment is unsatisfactory.

What is the answer? In my opinion any nursery stock worth propagating and growing should not be subjected to deep-freeze conditions while above ground. There's no doubt the market for nursery stock in containers will be even greater in the future, so let's face it, if we are to produce and have available a continuous supply of prime stock, then this material *must* be grown in structures wholly suitable for the growing season as well as for protection from wind, freeze and thaw during the dormant period. To succeed, we must have greater control over the environment in which we grow container stock.

To accomplish this I feel the wind-resisting, versatile and functional quonset-type polyhouse permits a means by which producers may successfully manage these crops. Of course, I realize construction costs do not permit rapid nor complete change-over to this system, for in many instances very large acreages are involved. But there must be consideration of this or a similar program in order to profitably compete, otherwise in the future the greater part of this production will be in frost-free areas of the country.

I believe we are justified in using heat to control minimum temperatures in poly-covered storage units, just as we are justi-