

The last thing I want to cover is the matter of winter protection. Our findings parallel exactly those discovered in experiments elsewhere. We believe at Dundee that our plants are not damaged by the absolutes in temperature. I feel that most of the conifers which we are growing are tolerant to temperatures which they are likely to receive in Dundee. But the damage that does occur, whether it is great or little, is almost invariably associated with rapid and violent fluctuations of temperature. The fact that you have detached the soil parcel from the ground, where it would be affected by the leavening influence of the earth's crust, subjects it to frequent changes in temperature. In Dundee, those changes, rapid as they may be on a clear night in June, are all within the growing range of the plants. In contrast, the changes that take place in the winter are beyond the range of growth, and the plant roots can actually be injured.

I think it was pointed out quite rightly that the degree of winter protection which is necessary is determined, first on an economic basis, and second by exactly what performance you want of the plant the next year.

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MODERATOR MATKIN: Thank you, Jack. It is obvious that you have an interesting ability to make observations and to express them in words that are understandable.

Last, but not least, certainly, is a report of a container growing operation in the East. This is at Corliss Brothers Nursery, Gloucester, Massachusetts. Mr. Clifford Corliss will describe the methods used by that nursery.

Mr. Clifford Corliss presented his paper entitled "Container-Grown Shrubs In Massachusetts." (Applause)

CONTAINER-GROWN SHRUBS IN MASSACHUSETTS

CLIFFORD CORLISS

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Being at the end of the program and following these able speakers on container-grown material, I think the task would be a lot easier for me to tell you what we don't know about growing container stock than what we do know. However, as you well recognize, California is one situation, Texas another, the Midwest another, and we, in Massachusetts, have another.

I am going to tell you what we have done. We were one of the very first people to grow small shrubs, especially roses, in Cloverset pots years and years ago. We never got very far with shrub material because if the pots were carried over for a year, or occasionally for two years, that was an expensive operation. But we did very well with roses.

Our experience with metal containers is this. I, for one, could not see using a container that had to be cut and until the advent of the Plantainer and the Nursery Can, we did not enter the container business. We used some Plantainers, and after some experimental work, shifted to the

Nursery Cans. The Plantainer is a good container, there is no question about it, but after we grew plants in them for a year, especially fast-growing plants, we had a job to get the plants out of that container. In most cases we have not encountered this difficulty with the Nursery Can because the bottom pushes out. It has been said that the bottoms rust out. Some of them do, but if you get a three-inch pipe stand with a solid block on top, you can push the can on tight. We have had little or no trouble from rusting. Therefore, I favor that type of container. We are using both the one and two-gallon sizes.

Now, as far as soil mixture is concerned, our situation is different from other parts of the country. I do agree there should be a uniform soil mixture if it can be worked out, and, apparently most growers are doing this. We are not at the present time. Our soil mixture consists of one yard of washed pea-size gravel, two yards of good loam, usually on the clay side, and two yards of peat. We mix these together and add gypsum or lime depending on the plant to be grown. Usually we add 50 pounds of rock phosphate, 100 pounds of magnesium lime, and 20 pounds of superphosphate. The material is sterilized and put through a Kemp shredder. It is not screened. Then we add 10 pounds of 7-7-7. If we are potting rhododendrons or other plants that require acid soil, we use an acid 7-7-7.

Our canning operation is all by hand. We are only a small operation compared with those in Texas and California and we have not invested in machinery to do the canning.

Before I discuss the various plants we grow, I want to tell you why we use pea-size gravel in the mixture. It has been suggested at different times that we might get away without using this, but with the heavy clay soil, which we have in our area, we do not get the aeration that is necessary. As each one of the preceding speakers has said, aeration and drainage are important.

We are doing something else which most of you would consider to be an extra expense. We are using three-quarters of an inch of crushed stone in these containers. Maybe this is an added expense, but until we know better, we will continue to do it.

With this type of mixture, we canned some 10,000 plants in the late spring or early summer of 1954. At that time we tried numerous plants of various kinds, including some of the plants that we thought would present problems. We used two-year bed grown *Rhododendron catawbiense*, *R. carolinianum*, *Pieris floribunda*, *Taxus cuspidata*, *T. cuspidata capitata*, *Cotoneaster divaricata*, *C. horizontalis*, *Buxus welleri*, *Pyracantha coccinea Lelandi*, *Euonymus fortunei radicans*, *Buddleia*, *Caryopteris Blue Mist*, *Ampelopsis heterophylla*, *Lonicera Heckrottii*, *Polygonum Auberti*, *Wisteria sinensis*, and many more.

Those plants went through the winter of 1954-55 and the loss was negligible—we may have lost two or three here or there. This is very important to us because we had heard of many nurserymen who have had lots of winter loss. There were only three of the 800 *Pyracantha* which did not survive. That kind of loss can happen in the field. We usually keep pyracantha in a protected frame for two years before we put them in the field. I think that speaks fairly well for the mixture used, the aeration and drainage, and the over-wintering.

In 1955, in addition to the material already mentioned, we planted Azlea, Forsythia, hollies of various types (*I. convexa bullata*, and *I. opaca* including many named varieties), junipers, *Taxus*, *Pieris japonica*, *Leucothoe Catesbaei*, *Pyracantha crenulata kansuensis*, *Rosa Hugonis*, English Ivy, hybrid rhododendrons, and *Clethra alnifolia rosea*. We had some trouble with *Hypericum*.

Now, as to fertilization, what we have done is this: as you will recall, all the new plants in a container have the 7-7-7. We leave them about four or five weeks, depending on when growth starts. After they have started growth in the containers, we will give them another application of fertilizer, the equivalent of about one tablespoon of 7-7-7 to each container. Then we feed them about every three weeks with a water soluble fertilizer. A 20-20-20 has given us very good results. We have also used a 30-15-30. This seemed to be equally as good as the 20-20-20.

As far as the watering was concerned, we felt that watering by hand was an expensive procedure. With our system, we can water all thirty beds at one time if we wish, but usually only ten beds are watered at one time.

Our beds are eight feet wide, sixty feet long, and there is a three-foot aisle between each bed. A valve controls the water to each bed. There is a special coupling on the three inch main which permits the use of a flexible hose to connect with the aluminum pipe. We are using aluminum pipe with copper risers. Some of the copper risers are a foot, some which is made by Skinner and called the "Superior." This nozzle can be twenty inches, and others thirty-six inches high. We use a flat nozzle adjusted to cover a diameter of 4, 6, 8, or 10 feet. By using the ten foot diameter spread, we do not have small dry triangular areas. There is some overlap, but not much. We use the old method of sticking a finger in the soil to determine when to water. We feel that any grower who owns a nursery should know whether a plant needs water or not.

We still have a lot to learn about the container business, but, I think we have made a good start.

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MODERATOR MATKIN: Thank you, Mr. Corliss for completing the morning discussion on container-grown nursery stock. Questions and discussions about this topic have purposely been delayed until the end of the panel. I think the discussion period can best be handled by your president.

PRESIDENT FILLMORE: Please state to which of the several speakers your question is directed.

MR. CHARLES E. HESS (Cornell Univ., Ithaca, N.Y.): This question is for Mr. Barker. In the tests made with the containers on gravel and soil, which condition do you feel gave the best results?

MR. BARKER: On the plant growth there was not too much difference. From the standpoint of over-all area neatness, I would say that the gravel was best.

MR. JAMES S. WELLS (Bobbink Nurseries, East Rutherford, N.J.): What fertilizer does Mr. Matkin recommend for dry feeding and how often should it be used?

MR. MATKIN: As Jack Hill pointed out, fertilizing is largely related to frequency of irrigation. For dry fertilizing, we have normally endeavored to use something that would have a prolonged effect. Sometimes the size of the plant has to be used as an index in determining how much to apply. A mixture consisting of such things as the urea formaldehyde resins, the hoof and horn bloodmeal, mixed with superphosphate and sulphate or muriate of potash to give approximately a 3-1-2 ratio used at one to two month intervals during the growing period is not unusual. Quantities equivalent to one to two heaping teaspoons per gallon of container size are used. There is no recipe that is going to fill all circumstances. It has to be adapted to your own particular operation.

MR. MARTIN VAN HOF (Rhode Island Nurseries, Newport, R.I.): I would like to ask Jack Hill how they prune the evergreens?

MR. HILL: Our general practice in trimming follows the basic rule of trimming a little and often. Because we can focus our labor effectively in these container areas, it is possible for us to control the growth of a Pfitzer's juniper to a large extent without ever using a knife. You can do it by pinching. It is a case of pinching every time you see a branchlet getting out of hand.

We stake the upright plants. I am talking particularly of grafted junipers. We stake and keep the leader going upward the first year. The second year it may be necessary to discourage that vertical development in an effort to throw more of the growth into the lower branches to fill out the plant.

On spreading types, on the other hand, we pinch quite hard the first year to make certain that the framework for the subsequent development of the plant is ample and adequate.

MR. WILLIAM H. BURTON (Burton's Hill-top Nursery, Casttown, O.): I direct this inquiry to Mr. Hill. How do you prevent action of the fertilizer on the container?

MR. HILL: We have not had any experience nor do we anticipate any problem. Our program is planned on a two-year basis. By that, I mean that if we recognize the precept that we shall go to market with the maximum size plant in the smallest container, we are going to produce a plant in a gallon container for sale at the end of the two years. The plants scheduled for production in larger containers will probably be shifted from the one gallon container at the end of the first year. Therefore, it is never in any one container longer than two years.

MR. DONALD J. VANDERBROOK (C. W. Stuart Company, Newark, N.Y.): I would like to know if any work has been done with a completely sterile material such as sphagnum moss or vermiculite?

MR. HILL: Yes, we have tried material of that type to a limited degree. It is soilless but it is not sterile. We added, as a bulking agent, approximately 30 per cent styrafoam to sand. However, there is quite a problem of getting the plant to become established in heavy soils. We have about discontinued experiments with any medium that will not enable an easy and rapid establishment of the roots in ordinary soil.

MODERATOR FILLMORE: Perhaps Mr. Matkin will also comment on this point.

MR. MATKIN: We have constantly heard that sphagnum moss is sterile, that it is disease free. It has been our experience, particularly where sphagnum is used for foliage plants, that it is not sterile. In the West, we have adopted a standard procedure of sterilizing all sphagnum before it is used.

MR. PAUL R. BOSLEY (Bosley Nursery, Mentor, O.): I would like to make a comment rather than to ask a question. After the soil has settled in the containers, we have added ground corn cobs to that space and have found that our watering was reduced 50 percent. In other words, instead of watering every day, we could water every other day. The surface was never really dry. I think mulching has possibilities.

MR. LESLIE HANCOCK (Woodland Nurseries, Cooksville, Ontario): This question is for Mr. Matkin. Is there any objection to the use of cow manure?

MR. MATKIN: Yes there is. The use of materials which are not reliable chemically or physically is objectionable because the entire approach is one of as complete control as possible. Manures, in general, are notoriously non-uniform. Many of the troubles we originally ran into in developing a standard system of growing developed directly from the use of manures. They are not necessarily either similar chemically from time to time nor are they stable in the soil.

MR. ARTHUR J. LANCASTER JR. (Coleman Nursery, Portsmouth, Va.): Using an overhead watering system, how can a plant with a 36-inch spread be watered satisfactorily?

MR. ROLLER: That is a problem with a number of the plants which are grown in southern areas. About the only thing we do in a case like that is to leave the sprinkler on for about twice the normal time. Some of the water is going to reach the soil in the container.

MR. EVERETT CONKLIN JR. (Rutgers University, New Brunswick, N.J.): What is the over-winter survival of plants which are canned in the fall?

MR. CORLISS: We planted some material in September, 1954 from beds. The containers were mulched with sugar cane. We had 100 per cent overwintering.

MR. ZOPHAR WARNER, (Warner Nurseries, Willoughby, O.): Fall potting should be done early enough to get some new root growth.

MR. BRUCE VANDERBROOK (Vanderbrook Nurseries, Manchester, Conn.): I would like to ask Mr. Matkin if he thinks two to three foot evergreens can be grown successfully in containers?

MR. MATKIN: Yes.

MR. TED FOULKE (Peeper Hollow Farms, Cleveland, O.): Mr. Corliss indicated rather high survival of plants, but I don't think he mentioned whether they were protected or mulched?

MR. CORLISS: We have tried over-wintering small quantities of plants without mulching. Most of the plants have been mulched with about one inch of sugar cane. Even *Pyracantha*, when mulched, came through in a fine condition.

MR. CHARLES E. HESS: I would like to hear Mr. Matkin's comments on the use of mulches to reduce water loss.

MR. MATKIN: This is certainly in accordance with our overall idea of trying to reduce labor. It is also an effective factor in reducing evaporation. If you are going to use clay soils, it has a further advantage in that the water droplets will have less tendency to splatter and puddle the surface of the soil.

MR. JAMES S. WELLS: One of the most important things we have heard this morning is Mr. Matkin's comment on and his pre-occupation with cleanliness. I would like to ask him how much difference he thinks it can make in the efficiency of all the events that produce available plants in container practice, if sterile practices are followed?

MR. MATKIN: This could be a lecture, but time will not permit. Naturally if you are lucky, you will have no disease problems and you will receive no benefit by taking special effort to be clean. However this is seldom the case. Usually the benefits to be obtained by clean procedures result in salable plants, which would not otherwise have survived the growing operation. This may vary from a moderate 20 to as much as 100 per cent. I have seen an entire crop lost, especially of sensitive plants, because of disease conditions resulting from unsterilized procedures.

PRESIDENT FILLMORE: Time dictates that this session on container-growing must be terminated. I am confident that much has been learned from each of the speakers and that many of you will view container-growing in a different manner. Our thanks to every one of the participants on this panel.

The session recessed at 12:30 p.m.