

The chief benefit of potting for us is that we have been able to eliminate the planting of any coniferous material into beds, thus saving the tremendous amount of hand labor involved in keeping the beds clean. We are able to plant directly in the field, and to sell the liner directly from the row as a B & B plant.

We have adapted a 20 inch row spacing from the local lettuce farmers that works exceedingly well. The potted liners are spaced 16 inches in this row, giving us a population of approximately 20,000 plants per acre. With this spacing we are able to grow a taxus, for example, to a small salable B & B plant after three years on the row.

Planting is done with a four row mechanical transplanter, made in Holland, Michigan. This is the wheel type transplanter with neoprene fingers. It has worked out better than any expectations we had for it. The plants are set uniformly at any depth required. There is no root drag and they are *firmed in much better than is possible even with the best of hand planters.* Cultivation is done with a four-row independent gang cultivator.

The potting itself is now done into peat pots which are not as good as veneer plant bands for speed in potting, but what is lost at potting time is regained at planting time by not having to remove the band.

The mix we use is the U. C. mix C, 50 per cent peat and 50 per cent sand, with a base fertilizer supplemented with a 3-1-1 ratio liquid fertilizer in a concentration of 30 ppm nitrogen every third watering. Planting is done the following spring or early the same autumn. We have found that by potting we are able to produce a salable plant more cheaply than by any other means.

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MODERATOR MAHLSTED: Now, since Dick summed it all up in about two minutes I think we should pay special attention to him when it comes to the question and answer period.

Gerald, if you will give us your thoughts on this subject, we will conclude our panel discussion.

Mr. Verkade presented his talk on the advantages of potted liners in production.

ADVANTAGES OF BANDED OR POTTED LINERS VERSUS BARE ROOT MATERIAL

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The three advantages to potting liners are (1) to maintain a higher survival with certain plants, (2) to produce a salable plant sooner, and (3) to extend the planting season. The main disadvantage is the added production cost which amounts to four to seven cents for each unit.

We use two types of pots in our operation. For our grafting understock we use a 2 1/4" plastic rose pot, which has to be removed before

planting. For our cuttings we use a 2¼" or 3" square peat pot

Cotoneaster horizontalis, and *C. praecox* are potted because of low survival. I have found that leaving these summer cuttings in the rooting medium until spring and transplanting them bare root has often showed a 25 per cent to 50 per cent loss. By potting them after they have rooted and placing them in a frost free frame, usually 95 per cent survive the winter and planting operation in the spring. Magnolias, viburnums, Pink dogwoods, and Japanese maples are also potted. These items after potting are placed in a controlled warm frame for the winter. I have tried overwintering them in the rooting medium and although most of them are alive in the spring, bareroot transplanting gave us high losses. Therefore to produce a salable plant quicker and to extend our planting season we pot these items

For the past four years we have been growing plants in one and two gallon containers. Because of a limited container area we have found that by potting some varieties they can be sold after one growing season. Bare root stock did not always make up to size. We therefore pot *Forsythia*, *Weigela*, and *Euonymus*. The potted *Euonymus* cuttings will be about 75 per cent salable in one year. In order to get *Forsythia* and *Weigela* to make up in one year we use one year old light hardwood cuttings and can them bare root, or use potted summer cuttings. I believe the potted summer cuttings make the nicest finished shrubs.

Cotoneaster horizontalis, *C. praecox* and Magnolias are also potted. We not only pot these in order to have a higher survival rate, but we have also found that potting enables us to sell close to 50 per cent after the first growing season.

Rhododendron cuttings are rooted in the fall and potted in 3 inch peat pots in January. One big reason we pot these is that we sell 30 per cent or more in May of that same year. It is much easier to pick out the best if you don't have to cut them out of the flat. Another reason is that we find the root and top growth is far superior the following fall. We grow all our hybrid rhododendrons in containers one year. We grow a few thousand azaleas each year. I have found that potting the summer cuttings and planting them into containers the following spring, we are able to grow them at a profit in two seasons.

There is only one variety of *Taxus* that I will pot, ie. *I brevifolia nana*. These are potted because of the low survival rate the first winter in beds. They are potted in June from the rooting medium and are kept in a frost free frame the first winter. This variety is the only one which stem splits the first winter with us. I honestly can not see any good reason to pot other Yew varieties. The benefits are so little that I do not believe it covers the cost. I do not recall any serious problems in transplanting cuttings, or 2, 3, or 4 year old bare root liners as long as they have a good healthy root system and it is not too late in the season.

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MODERATOR MAHLSTEDDE: Thank you, Gerald.

The floor is now open for questions. I didn't know Martin had loaded the panel with men that used banded or potted liners rather than bare root material. I think you men in the audience have a few things you might add in regard to bare root transplanting. Is Bill Flemer in the room? Bill, last year I remember that you mentioned something about the rooting out of plants in peat pots. Have you anything to add to this discussion?

MR. WILLIAM FLEMER (Princeton, New Jersey): Yes, the reason we like to use peat pots, John, is that you don't get that snarl of roots within the pot itself. The old roots come out, start growing and new roots come out from the inside of the ball. These also keep growing so in turn you go to the field with a plant that has a large fibrous root system just going out to the edge of the pot. If the same plant is grown in a clay pot, the roots spiral around on the inside of the pot and you get conditions in the field very similar to that of the holly plant that Spence Davis told us about this morning. As a result we have gone over entirely to peat pots except for one or two exceptions.

I would like to hear whether Jack Hill is using the peat pots and what he thinks of it at Dundee.

MR. HILL: Bill's question to me, as I understand it, is what do we think of peat pots in Dundee? We have just begun to experiment with peat pots. I will confess to all of you, as close as we live to George Ball that I looked at it for a long time before I could see where there was any real value for production of conifer liners. It was always my impression that the peat pot broke down rather quickly. We find from experience that plants in peat pots can at least be held as long as they can in clay products with complete alleviation of the problem which Bill describes relative to the circling of the roots. Mr. Wells' understanding is that all roots are oriented by gravity except when they are mechanically constrained in a structure. When a plant is taken out of this clay pot with the roots well circled, placed without disturbing it in the soil, the damage does not come from the root which continues to circle, but rather comes from the cone structure that arises when the already circled root increases in diameter resulting in a girdling, choking effect.

Summing it up quickly, I think we do like the peat pot. I think Bill Flemer really gave me an idea several years ago when he described his method of setting the pots up dry, that is, after the rooted cuttings were placed in the pots and the pots were set for multiple handling, they were not squeezed together. There was a deliberate attempt made to set them carefully so that there was an open space between units. The purpose of the space in there was to allow air to reach all sides. Also, it prevents invasion, that is, the roots in one pot cannot invade the pot of the plant adjacent. We are all for peat pots now.

MR. JOHN VERMEULEN (Neshanic Station, New Jersey): We have almost completely gone over to peat pots in all our potting and liner production. We put our peat pots in a container for shipping. We have two sizes, that is a small container for 12, and a large container for 36. It is a big saving.

I also have a question for someone on the panel. We had a big loss of azaleas potted in peat pots last winter. We had it once before and I thought we had overcome it. We potted the cuttings in February and about the middle of March we started to lose these plants. We lost approximately 15 to 20 per cent of our cuttings. We have tried to trace it down and as far as we have gone, it appears that there was too high a soluble salt content in our soil. Also, we think that it may be in the pot itself. This year we have pots imported from Sweden to check on this. Can anyone tell us, how to eliminate this and be sure it wouldn't happen again?

MR. GERALD VERKADE: I don't know if I can tell you the exact reason for these losses. I had a very unfortunate experience with the thick peat pot. I try to use the thinnest type peat pot I can. I found that especially with our rhododendron cuttings last summer, that once in a while a plant would drop off. The only reason we could see for the loss was that they were too wet. What we do now is to use a very thin pot on our azaleas. When we plant them out in the spring we try to stack them so there isn't a tendency to hold water, especially for three or four days consecutively.

MR. JIM WELLS: I would like to make a couple of comments and ask Gerald a question. First of all, we killed a lot of plants like firethorn with Jiffy pots. They don't over-winter at all in the frames. I think it was my own fault. I wouldn't really blame it on the Jiffy pots. I think they just got too dry. I wasn't used to using them. I found that under my method of growing that putting the plants into flats was greatly superior. The same is true of *Prunus Hally jolivette*, and so I abandoned the Jiffy pots.

In regard to this pot, we ran a pH test by crumbling up the peat in a pot and running it on a one to two dilution. We came up with a reading of four, under which we consider it to be quite lethal. Now that is not a very good experiment because the soil is immediately put in there and it is diluted before the plant starts to grow. Nevertheless, that pot, in my opinion, was just a plant killer. Perhaps it unfortunately was under the spigot when they turned on the fertilizer, but it wasn't very good.

The question, Gerald, I would like to ask you is, Do you take the pot off your rhododendron when you put them in the can?

MR. VERKADE: No, we do not.

MR. WELLS: And what medium do you use?

MR. VERKADE: I have done it two ways with the rhododendron. I have used straight peat as a medium in the peat pot. The following year we used peat and perlite. The medium I root my cuttings in is the medium it is potted in.

Now in our can we use our regular container mix. I don't want to go into all the details of the container mix since some other time might be more proper. However, it is the same mix we use for rhododendrons. I take the rhododendron in the spring and crack the pot. This is not the standard peat pot that we use, but rather a thinner one. It is much thinner and has a hole in the bottom. If you squeeze it, it can be broken easily. The roots will grow out of it, but we are still

breaking the pot up. We drop them in the larger container and put a can mix around them.

MR. WELLS: I have always been an advocate of potting. I brought in some rhododendron liners this past spring from Portland, Oregon, and they arrived in the most perfect condition, beautifully packed and beautifully grown, by Railway Express. The plants had tight balls of roots which had been lifted from a bed of peat. You could throw them about. In fact, I did, without damage. I have always argued that the potting of a plant in an artificial medium and then putting it out into the field created an oasis in which the plant was likely to remain. That hasn't proved out in practice. I have planted these plants from Oregon in my nursery and they are the best plants I have in the nursery. I am switching over entirely to a peat medium for growing liners. These will not be in pots.

MR. A. J. RADDER (Bloomfield, Connecticut): I worked for a nursery and we used up to one million peat pots for the potting of tobacco plants for resetting in the field. Last year they found out that a certain number of them in the peat pots were completely stunted while other ones grew very well. After they sent them to our own laboratory we found out that those in the peat pots that came from Denmark were completely stunted. The reason was attributed to the type of fertilizer they used and the heavier wall.

(Editor's note. This situation has since been corrected.)

MR. MARTIN VAN HOF. I think it would help also to take off the top of your peat pot or tear it before planting.

MODERATOR MAHLSTEDE: That brings up the question of wicking. The placement of the peat pot in relation to the soil surface is a very important consideration.

MR. HOOGENDOORN: Two years ago it was a hard winter. The previous spring we had planted out some hollies in peat pots for the first time. I found in the spring they had all heaved out and dried up. Then last year, Bill Flemer had the same trouble in the field. The reason they heaved up is because the pot had wicked, dried and the root didn't go through the walls of the pot. There was nothing to hold them in the ground. This past spring we tore off the upper half of the pot and then planted. We still kept the ball intact but got away from the wicking.

MODERATOR MAHLSTEDE: Any further comments on wicking? Dick Vanderbilt.

MR. VANDERBILT: It is not the wicking but rather a comment on the use of pure peat for rhododendrons. Case said that he had no trouble with rooting out once the lip of the pot was removed. That would be true as long as the peat is saturated. You can get over this problem if you treat them with a wetting agent like Aqua Gro.

The rhododendron is in a peat ball, pure peat. If you plant that out it won't always root out until the peat ball is 100 per cent sopping wet. If you try the Aqua Gro, regardless of whether the peat is ringing wet or not it will root out in a sandy soil.

MR. FRED NISBET (Asheville, North Carolina): I would like to address a question, please to Mr. Verkade. Do your thin pots hold up

over the entire season? We start pulling our azaleas, rhododendrons, pieris, and such, from the open mist beds in August, and of course we have a problem that no one else has here, that is we don't have adequate help. Therefore, the process strings out until normally October. We put them in frames. The question then is, "Would these peat pots hold up until we could start putting them into beds in the nursery in late May or June?"

Now the pots we have been using have a fairly thick wall. They hold up satisfactorily as long as May and June if we handle them very carefully. However, with any amount of handling at all they go to pieces. Will the thin pots hold up as well?

MR. VERKADE: They will not hold up as well. In fact, I don't think you could use the thin ones. On my rhododendrons we pot the cuttings well in November, and can them in the spring. So, actually, we only hold them probably three months in the peat pot, at the most. I never have kept anything all summer.

MR. NISBET: We keep them anywhere from August to October until May or June in trenches.

MR. VERKADE: From October to May I believe they would hold up that long. During the summer I don't think so. During the winter months when there isn't so much root action I think they would hold up.

MR. NISBET: I support Dick Vanderbilt's comment on the use of Aqua Gro. If you are using peat pots or anything else hard to wet, it would pay you to get onto this stuff because you can do a wonderful job with it. I think it saved at least 3,000 azaleas for me this year which wouldn't have had a chance without it.

MR. PETER VERMEULEN: We made a test with two year old taxus cuttings, which were either transplanted to a bed or put into three-inch peat trays. This past year we had an excessive amount of moisture and we had a lot of loss because of wet feet. For the peat pots in the frames we had comparable or better growth and absolutely no loss due to wet feet. We found there was a decided advantage to the use of peat pots.

MR. STROOMBEEK (Perry, Ohio). This question is addressed to Mr. Vanderbilt, in relation to the use of Aqua Gro in transplanting. I tried the material out and it seemed to work very well. However, I found out too late in the season that you have to keep repeating the application, otherwise you get serious wilting or stunting. Have you noticed that, too?

MR. VANDERBILT: I never tried it on deciduous stock or on rhododendrons. We give them one treatment after potting and another one before they go out. The root action begins in the soil within seven days, and we feel that once root action has begun in the soil, our problem is over as far as using Aqua Gro. We have not repeated it and felt we haven't needed to.

MR. HERMAN SANDKUHLE (Oakland, California): What is your experience with round pots versus square units?

MR. VERKADE: I like the square mainly because they fit so nicely and there is less chance for the medium to run in between them.

MR. SANDKUHLE: What about watering?

MR. VERKADE: Your watering problem is minimized. They occupy the same amount of room but they look neater in the flat.

MR. SANDKUHLE: You have had no problem from the lack of air on the sides or rotting out of the bottom of the pot?

MR. VERKADE: I haven't seen too much difference.

MR. SANDKUHLE: John, I'd like to make one comment. We have a fine medium for use in the peat pots on the West Coast. We happen to be a user of the UC Mix. Using Redwood sawdust and sand we find in the small peat pots we create quite an algae problem. If not taken care of, it puts quite a crust on the top of the peat pot and, therefore, slows up the percolation of the water. If you are anticipating changing, you want to watch the algae problem.

MR. JACK HILL: What do you do about this algae problem?

MR. SANDKUHLE: At the present time, Jack, we use a copper spray and we have eliminated some of it. We had not noticed it at first and did not take care of it. As a result we had to go in and actually remove the crust. It puts a membrane on top of the medium, somewhere in the neighborhood of twenty-thousandths of an inch, and it prevents the water from going in.

MODERATOR MAHLSTEDDE: I think you will all agree that the panel has done an excellent job, so let's give them a hand. (Applause)

It is a pleasure for me to introduce Donald J. Moore, Reforestation Officer, from Hamilton, Bermuda. He has traveled a long way and probably invested quite a bit of money to be here with us this afternoon. After talking to Don before the meeting, I am certain that he has an interesting message to bring us on the topic, "The More Unusual Aspects of Plant Propagation Methods and Experiences in Mist Propagation in Bermuda." Don Moore!

Mr. Donald J. Moore presented his address.

THE MORE UNUSUAL ASPECTS OF PLANT PROPAGATION METHODS AND EXPERIENCES IN MIST PROPAGATION IN BERMUDA

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Before proceeding into the main subject matter of this paper, it is, I feel, essential to acquaint you all with a few statistics relevant to Bermuda's geographical location, climatical data and topography. Whilst these factors may not effect propagation to any great extent in a broad sense, they most certainly do dictate problems to us locally. They do this in no uncertain matter.

Our climate may be described as sub-tropical. Geographically, however, we are located in the Temperate zone. Exact location, relevant to the nearest point of land, is 568 miles from Cape Hatteras. The nearest west indian island is Abaca, some 700 miles to the south west. Contrary, to general belief, we are not part of the West Indies, but are indeed, very much an isolated land mass.