

## PLANT PROPAGATORS' QUESTION BOX

MODERATOR ROLLER: The question and answer part of our program will be conducted by the moderator of all moderators, Mr. Hugh Steavenson.

HUGH STEAVENSON: We have a number of questions here and we've got a whole room full of brains to answer them. The first question is "Has anyone grafted the dove tree (*Davidia*) on *Nyssa sylvatica*?"

JOHN VERMEULEN: We have tried it a number of years ago and had no success. We had some callus but they did not unite in the proper way. They lived for a while but were dead about six months afterwards. We tried it for two seasons and gave it up.

HUGH STEAVENSON: Why not graft the dove tree onto the dove tree?

CASE HOOGENDOORN: You can grow *Davidia* from seed but it is a very difficult process. Al Fordham told us how to do it. He said to keep the seed for 3 months in the greenhouse at 60° - 70° F. and then you sow them. And we had them. We potted them in 2½ inch pots and they grew probably four inches high. Then we planted them out in the spring and had a hard wind and lost all but eighteen.

JEORG LEISS: We had *Davidia* from Holland and they were all layered which may be the best way.

HANS HESS: You fellows in Canada are lucky. You get them in from Holland and they don't gas them. When we get them from Holland, they are gassed and all die.

CASE HOOGENDOORN: If they come from layers, we should be able to root them some day because they go on their own root. But in this great country layering is out of the question.

MR. LOWENFELS: I got this right from an expert in the city of Rochester. He said freeze the seeds and let them freeze hard, plant them outside if you want, and they will come up in the spring and you will have *Davidia*.

MODERATOR STEAVENSON: Has anyone compared chloromone with indolebutyric acid?

HANS HESS: When I first got a sample of chloromone I put it on the shelf thinking that here is another batch of stuff that might be well to forget about. We had a batch of *Ilex glabra* cuttings we are putting in and I thought well I'll see how good this stuff really is, so I dipped the cuttings in the full strength chloromone (these were dormant cuttings not summer cuttings). I was amazed about 3 weeks later. I took a couple of cuttings out and they were virtually exploding with roots. There is no two ways about it, they rooted 100% and they had a mass of roots. There has been a lot of adverse talk about it. Charley Hess analyzed it and it is a high concentration of naphthaleneacetic acid. The material does work well on dormant cuttings of all *Ilex* varieties. It also works well on *Taxus* and on *Pfitzers*. If you mess with the stuff for a while and dilute

it for various varieties so it doesn't burn, it gives good rooting results and it gives them consistently. Now this is my own experience, I know others have not been as successful. It's just a question of finding out how much to use and when to use it and what type of cuttings. Also when you put the cuttings in, instead of dipping them an inch or an inch and a quarter into the solution, just dip in about a quarter of an inch of the cutting into the material and that is all that is necessary.

PRESIDENT ROLLER: I'd like to go along with Hans. I've always had the stable stuff and have used it on hundreds of thousands of cuttings with this reservation. That it is more effective on the broad leaved evergreens we grow in the south than on the conifers. We use it on our regular production here for several years.

PETER VERMEULEN: Dr. Cathey mentioned last January at our New Jersey meetings that he used chloromone on soft wood *Rhododendron Roseum elegans* cuttings and got amazing results.

CASE HOOGENDOORN: I've had a wonderful experience! I bought a bottle of this chloromone one time and next thing I had an inspector from the food and drug come in. He said did you buy any of this chloromone? I said, "Yes, I did." He said is it any good? I said I tried a little of it, and up to now I don't think much of it. He said where do you get it from. Well, I think it was in Jersey some place. And he said, would you mind giving us this bottle. They want to prosecute the people for misrepresentation. He said how much did you pay for this bottle. I said three dollars. He said would you mind giving us this bottle for three dollars. I said, no, go ahead, it's no good anyhow.

Anyhow, we have had a lot of trouble rooting *Taxus repandens*, and last year I got a brainstorm. I dipped those repandens in chloromone and #3 powder. Then we stuck them in peat and perlite. As we were sticking them a fellow came in and said "You sticking them in peat and perlite?" I said well there's nothing like trying. He said we've done a lot of them and they all rotted. Well, that didn't sound good. Well we had some also in peat and sand. Most of them were in peat and perlite and we lost them, but the few we had in peat and sand, rooted heavily. And it was straight chloromone and #3 powder and that's how we're going to stick them now.

MODERATOR STEVENSON: Now that we have taken care of chloromone, is there a difference between using IBA in powder form or as a liquid dip?

DR. HESS: We have tried this comparison a number of times and using the same concentration of IBA in talc and in the liquid form; we found the liquid form was much more effective, giving higher rooting results. I think there are several reasons for the better results with concentrated dip. First the IBA is dissolved in the concentrated dip so that it can enter the plant directly, second on cuttings with smooth stems you get a good film of IBA whereas with talc much of the material falls

off, and third, I feel you get a more uniform coating. For example, when you stick a group of cuttings in talc it is not likely to flow around the cuttings as easily as a liquid will. But whatever the reasons may be, the results have consistently been in favor of the concentrated dip. There are disadvantages in that the concentrated dip is not available commercially so you have to prepare it yourself.

VOICE: How do you calculate the strength?

DR. HESS: We use a range of concentrations, starting with 0.2%, 0.6% and going as high as 1.0% active material. A one percent concentration would be one gram of indolebutyric acid in 100cc of 50% alcohol. When preparing the IBA it is important to dissolve it in alcohol first because it is not very water soluble. The procedure for the 1% concentration would be to take 1 gram of IBA and dissolve it in 50cc of methyl or ethyl alcohol and then add enough distilled water to make a total of 100cc. The cuttings are dipped in the solution for 2-3 seconds and are then ready for sticking.

Another disadvantage of the concentrated dip is the chance for the transmission of disease. I am not sure how serious this problem is since the 50% alcohol solution should not support the growth of too many organisms. Two other points, is that you should prevent the evaporation of the solutions. Don't let them stand open for long periods of time, because the concentration of the alcohol will drop, and if it gets too low, the IBA will not stay in solution, particularly if you use high concentrations. Finally, it is best to store the IBA solution in a dark bottle and keep it in a refrigerator when you are not using it so as to prevent deterioration of the IBA either by light or high temperature.

JEORG LEISS: Can you add fungicides?

DR. HESS: Yes, this is possible.

MARTIN VAN HOF: Charley, you mentioned the 0.6% concentration. Can't we use #1 hormodin?

DR. HESS: No, Number #1 is 0.1% IBA, No. 2 is 0.3%, and No. 3 is 0.8% IBA.

MARTIN VAN HOF: I thought that No. 2 was 0.6%.

VINCE BAILEY: I would like ask Charley if he finds the concentrated dip more effective than the soak?

DR. HESS: Vince, we have not made a comparison ourselves since most propagators are reluctant to make their cuttings, and then let them soak in an auxin solution for 18-24 hours before sticking. They rather treat them and stick them in the bench right away. However, I know at least one case where an excellent response is obtained with the soaking technique. This is Hudson Hartman's work with hardwood pear cuttings. Hardwood cuttings are difficult to treat since materials do not move in too readily and by using the soak there is more time to get the active material into the cutting.

VOICE: Can you use quick dip on heavily wounded rhododendron?

DR. HESS: Yes, I see no particular problem here.

ROLAND DEWILDE: The problem we found was variation in humidity. One day we may have 25% humidity and the next time it may be 75% and obviously the rate of evaporation is going to vary and so will the uptake of the solution. So each day the uptake may be a little different from the day before. When they put talc in we didn't have this problem. Also I am under the impression that by use of the talc made it a little more tolerant to overdosage and burning was not so severe a problem.

DR. HESS: Roland, I believe that the reason the talc seems more tolerant is that at a given concentration it is not as effective as the concentrated dip. If you have good results with 0.3% IBA in talc and then use the same concentration with the concentrated dip you may get some injury because you are getting more effect out of the IBA you are using.

TOM PINNEY: Some one mentioned the use of carbowax. We found this very effective. You have no problems of evaporation as with alcohol. We use carbowax 600 and you can buy it for a couple dollars a gallon and you can go as high as 10,000 ppm active material without any trouble. Then you can add water to get the proper dilutions.

MODERATOR STEAVENSON: What is the most effective control of white fly in the greenhouse?

HARRISON FLINT: There are a number of materials that can be used, but the important factor is several repeated sprays. Three of four successive times at four day intervals.

MODERATOR STEAVENSON: Should crab apple grafts be coated with wax to increase their stand in the field?

MARTIN VAN HOF: We wax all our grafts, we dip them right into the wax. We store them away in peat, put them in a cooler, and put them out as soon as the ground opens up for the March planting. And we have excellent results.

HANS HESS: I would like to say something about the use of wax on grafts. The use of wax has been in our experience not beneficial. When the grafts are planted out and are just starting to develop along comes a 85° F. temperature. Right at the soil level the wax melts and girdles the scion and that's the end of the plant.

CASE HOOGENDOORN: You plant them too late!

HANS HESS: No sir. We don't plant them too late. But when you plant them and the wax melts in the sun you have trouble. Maybe where you are you have cooler air, but where we are, we have trouble.

BEN DAVIS: We graft a lot apples both fruiting and flowering crab, and we don't use any wax at all. We just use the regular grafting tape. We plant the graft union below the soil and cultivate up so only an inch or a half-inch of the scion is exposed. That seems to work best for us.

MODERATOR STEAVENSON: Can some one give us some information on the use of B-9 for rhododendrons, the strength used and time of application, and also the results.

DR. MCGUIRE: It's difficult to recommend a special time by the calendar, it depends upon the stage of growth of the plant. When the flush of growth is in a semi-hard condition this is the time to treat them. You can use the first or second flush. We have used a half percent and three-quarters percent and haven't seen any difference between the two. As I said we apply it in the semi-hardwood condition and then apply it again ten days later, because, of course, not every shoot on each plant is in the same stage of development. I will say that in the field we find quite a bit of variation from plant to plant. We have not had as good a result as compared with the container plants. On containers we can put buds on quite effectively.

MODERATOR STEAVENSON: How can we pack lilac liners in poly bags and still callus the grafts?

MARTIN VAN HOF: I don't think the poly bag has an effect. It is the temperature. Don't put them in a cold, you know, put them in a greenhouse.

DR. CHADWICK: You can cut your scions early, before the rest period is broken, make the grafts, put them in polyethylene, and store them at about 60 degrees for two weeks, and after they have started to callus, then put them back at the low temperature.

CASE HOOGENDOORN: Yes, but when you callus them don't you force growth into the scion?

DR. CHADWICK: No, not if you cut the scions before the rest period is broken.

MODERATOR STEAVENSON: How important is shade in the rooting of softwood cuttings and when should it be taken off?

MR. LESLIE HANCOCK: Shade is all important unless you have mist. You take it off once the cuttings are rooted, but you can't take it off all at once, there must be a transition shade.

PETE VERMEULEN: We put shade over our open mist beds this year. We used 20% shade. We got this figure from Charley from some work he did at Cornell as a graduate student some 8 or 10 years ago. We found very good results with it. I don't say we rooted cuttings any better than we did before but it was real good. It was sort of like the Nearing Frame. We put the shade over the mist bed and hung it over the south side, so that we got a lot of light from the north but no direct sunlight.

MODERATOR STEAVENSON: This question is directed to Henry Homer Chase. Is your layering technique useful in areas other than Chase, Alabama?

MR. GERALD VERKADE: I would say that it is not restricted to Chase, Alabama because we layer in Connecticut and I've seen it in Cleveland.

MODERATOR STEAVENSON: Has any one had experience with nutrient mist?

ROLAND DEWILDE: I never used nutrients in the mist system but I did feed the cuttings one time while under mist. You really had a big problem even putting it on in low concentra-

tions. You get a green slime over your sand, and then on the cuttings. I lost more growth than if I had waited until first potting the cuttings.

JOHN VERMEULEN: We have for the first time used nutrients in our mist. We have found it very effective in holding up the foliage in our deciduous cuttings. There was no yellowing. We found that they rooted sooner and they started to grow more than at any other time. I do not know exactly the strength but I believed we used 20-20-20 at about a teaspoon per gallon. We put it on two days in succession and then switched to other beds and kept switching until the cuttings were rooted.

MODERATOR STEAVENSON: This is for Bob DeWilde. What fungicide do you use for dipping your lilac grafts?

ROLAND DEWILDE: I believe he used Captan.

MODERATOR STEAVENSON: What type of cuttings should be used for clematis?

WILLIAM CUNNINGHAM: We utilize the double node system for all clematis cuttings. The percentage of rooting is 95% and in some cases 100%.

CASE HOOGENDOORN: Including Jackmanni?

WILLIAM CUNNINGHAM: Including Jackmanni. Using the double node system we can root Jackmanni 100%.

AL LOWENFELS: When do you take the cuttings and what hormone do you use?

WILLIAM CUNNINGHAM: All of our clematis rooting is done during the summer months because that is the only time that we have greenhouse space. Six months of the year we are rooting mums. We use Charley Hess' quick dip No. 2 (0.2% IBA in 50% alcohol).

BEN DAVIS II: What stage is the wood in when the clematis cuttings are taken? Is it mature and brown or is it real soft and thin, or is it the light green wood that's in between these two groups?

WILLIAM CUNNINGHAM: We take approximately four flushes of cuttings each summer. We use the blooming time as a guide to start on the blocks. The cutting wood is soft and the buds are showing at the leaf axils. We prefer soft wood. As the season goes on, and if you miss a flush of growth, the wood becomes hard and your percent rooting goes down.

DICK VANDERBILT: Bill, how do you overwinter the cuttings?

WILLIAM CUNNINGHAM: About this time of the year the clematis becomes dormant and some varieties have fall color like the trees. They become hard and the buds are initiating in the leaf axils. At this time of the year, and for the next two or three months, we wrap the clematis and put them in refrigerated storage and hold them in a dormant condition. They are already potted before storage and are wrapped in foil.

MODERATOR STEAVENSON: How do you explain increases in carbohydrate and N, P, and K under mist?

HAL TUKEY: The increases you saw in the slide of mineral

nutrients are experimental error. Most of the increases are very small and are not significant. The increase in carbohydrates is just the growth of these very fast growing herbaceous plants. They continue to manufacture carbohydrates under mist very well.

MODERATOR STEAVENSON: This question is directed to me. What form of nitrogen do you use to take care of your saw dust mulch?

As far as nitrogen is concerned, whatever is the cheapest. Usually, around our way, ammonium nitrate is the cheapest form of nitrogen unless we used anhydrous ammonia. I should say that the saw dust is used as a mulch and is not worked into the soil. So the nitrogen is primarily put on to maintain a good nutrient level in the plant. The saw dust is not worked in until the soil is prepared for the next crop and by that time it is pretty well broken down. The next question is, "What causes large callus formation instead of roots? Should such cuttings be discarded or can callus be cut to induce rooting?" Charley?

DR. HESS: Actually this was discussed earlier in the evening. I believe Dr. Chadwick had worked on this problem and suggested that if the pH of the medium is too high, callus was formed instead of roots.

DR. CHADWICK: Callus is formed by proliferation of tissue either by the phloem or pericycle. In several plants, probably not all of them, high water content in the medium showed an increase in callus formation. Also, there has been an indication on some plants, particularly Andorra juniper, that pH may regulate the size of callus. You seem to get a larger callus at pH values around 7.0 or 7.2 and more alkaline conditions and less callus at pH 6.5 and more acid conditions. As far as cutting off the callus is concerned, my personal experience is that it doesn't do much good. I think you get better results if you break it off with your fingers. If you try to cut it off you always leave some of the callus tissue there, and very often you just get a greater proliferation of callus.

PRESIDENT ROLLER: There is one other thing I found on some plants, particularly with certain junipers. The location on the plant from which the cutting is taken plays a role. Tip cuttings will give a large callus, cuttings from down in the body of the plant will give you roots.

CASE HOOGENDOORN: Dr. Chadwick, we run into this callus problem every so often. Could it be to over stimulation caused by too strong a hormone?

DR. CHADWICK: I cannot find any relationship between the use of growth promoting substances and callus formation on the bases of cuttings, one way or the other.

MODERATOR STEAVENSON: How do you propagate *Ginkgo biloba* vegetatively?

HANS HESS: Ginkgo can be rooted from soft wood cuttings. Under mist they root fine.

DR. CHADWICK: You may want to go back to a thesis written by a man of the name Chadwick. He reported excellent results from Ginkgo softwood cuttings taken about the first of July.

MODERATOR STEAVENSON: Dr. Cation, what is the value of virus free stock to the nurseryman?

DR. CATION: Since we started distributing virus free bud wood to nurseryman they have far better stands of cherries, more uniform and a larger size than they had when they used wood that was contaminated with ring spot.

MR. VINCE BAILEY: I can only speak from experience. We use nothing but certified virus free scions and budwood. We think we are getting better stands and a little better growth.

MODERATOR STEAVENSON: Has anyone grafted *Acer griseum* on the Trident maple?

WILLIAM FLEMER III: We have tried it on *Acer tridens* but it doesn't work.

MODERATOR STEAVENSON: What is the best procedure for rooting crab apples?

ROLAND DEWILDE: I've been doing it for about five years, first experimentally, and now we do it regularly. The crab apples will root. We have a little trouble with *Malus baccata* because they are so subject to apple scab that it is hard to keep the leaves on. We have best results with fairly juvenile wood, such as the shoots from the sides of the older stem, the so-called sucker shoots. We make the cuttings 6 to 10 inches long and stick them in sand and use either Hormodin No. 2 or No. 3, depending upon how hard a particular cutting is. Even on one shoot, we may use No. 2 for the top and farther down use No. 3. It takes anywhere from 3 to 6 weeks to get roots.

MODERATOR STEAVENSON: My experience with rooting *Cotoneaster apiculata* and *C. horizontalis* have been poor. Could someone comment on a successful method giving time of year cuttings were taken, hormone treatment, medium, etc?

MARTIN VAN HOF: This is from Newport country — it is in the United States. The cuttings are taken in the latter part of July and treated with #2 Hormodin and are placed under intermittent mist. The medium is pure sand.

VOICE: We have had the experience that if the cuttings were taken too soft, they would root without trouble, but soon developed a root rot and were lost. Cuttings taken later, such as late July, rooted well and did not rot. I think we need a greenwood cutting rather than a softwood cutting.

MODERATOR STEAVENSON: When do you top work nut trees?

BEN DAVIS II: We found that we can top work just when the leaf buds start breaking open. We even top-work successfully when the plants are in full leaf or almost in full leaf.

MODERATOR STEAVENSON: What effect does stock plant nutrition have on the rooting of cuttings? Is rooting improved?

PETER VERMEULEN: Definitely!



MODERATOR STEAVENSON: When irrigation is used to prevent frost damage, should it be left on until warmer temperatures return?

GERRY VERKADE: I have used irrigation on *Pyracantha* in containers. We brought them out of storage and they were breaking into growth. Then we had a frost. I put the water on, and kept it on, until all the ice was off.

HANS HESS: I might add to that. We had an early frost this fall. We had cuttings in the mist bed and didn't want them damaged. So we turned the mist lines on to run continuously. It ran all night and the next day until the ice melted off. The plants were not damaged with the exception of two flats of azaleas which were under a line that was not turned on.

DR. CATION: I think it is well established with strawberry growers that they leave the water running until the danger of frost is completely past. When they shut it off too early, the low temperature goes right through the ice and kills the blossoms. It's best to keep the water running. There is little or no insulation value in ice.

MODERATOR STEAVENSON: At what point should the mist intervals be decreased?

CASE HOOGENDOORN: When the cuttings are rooted.

MODERATOR STEAVENSON: What is the best spray program for the control of apple scab?

DR. CATION: The best material for apple scab is Cyprex. Cyprex not only eradicates the scab lesions, but it also prevents the formation of secondary spores from lesions already established on the leaves. The recommended dosage of Cyprex is one half pound per hundred, but growers have been using  $\frac{3}{8}$  of a pound and some are getting down to a quarter of a pound.