FRIDAY EVENING SESSION
December 5, 1969

PLANT PROPAGATORS' QUESTION BOX

The Question Box session convened at 7:40 p.m. in the East Ballroom. Mr. Ralph Shugert served as moderator.

MODERATOR SHUGERT: Good evening, Ladies and Gentlemen; we shall now call the Question Box Session to order. For the benefit of those attending this session for the first time we ask all to participate. In order to have proper identity, we are asking everyone to do two things; wait for the microphone, and please give your name so it can be entered in the Proceedings. This can be very enlightening and interesting segment of the program if everyone will cooperate and participate. Thank you.

Now for the first question. Dr. Tehrani, how does your method of rooting hardwood cuttings work for ornamental varieties of cherries and flowering crabs?

G. TEHRANI: It does not seem to work too well with varieties of cherries; and I do not work with apples, so I have not tried this.

JOERG LEISS: The same type of treatment as Dr. Tehrani mentioned has been used on the *Malus* understocks of the EM type with good results. We have rooted *Prunus cistena* and *Prunus besseyi* by sticking them right in the field as hardwood cuttings; some years we have good results, others not. We make them in February and March and as soon as the frost is out of the ground — during the first part of April — we stick and shade them.

GERRY VERKADE: Do you cut and store, or cut and stick them?

JOERG LEISS: We store them but use no hormone treatment.

JIM LAW: We have tried the hardwood program on *Malus* 'MM 106' and had almost a complete failure. Accidentally, we took some semi-hardwood cuttings taken just before the leaves abscised and had excellent results with these. We are starting with our second full-year program and I would like to report further on this a year from now and see if we can repeat what we did a year ago. We have also rooted *P. cistena*, in a manner similar to what Joerg described, but we put them under mist keeping them just wet enough so they don't dessicate and had excellent results with it — but we want to try to repeat this also.

DICK CROSS: At our nursery we take hardwood cutting of *P. cistena* in late November, cut them and place them in the bench during December when we can maintain low temperatures. If we can store them at 40°-45°F till February and

then raise the temperature we get much better results. We do use Hormodin No. 2; with No. 3 we got burning.

MARTIN VAN HOF: I think *P. cistena* is very easy to root. We take cuttings from growing plants in September and in 3 weeks they are rooted solidly.

MODERATOR SHUGERT: Andy Adams, I have the following questions addressed to you; does the fact that you did not use Cycocel this fall indicate that you are not completely sold on its merits; and did your azaleas bolt into flower the summer after its use?

ANDY ADAMS: We are completely sold on Cycocel. It was not necessary to apply it this fall because we had no rain during August and the plants were completely hardened off — there was no reason for using Cycocel. In answer to your second question, they bloomed at their normal time.

MODERATOR SHUGERT: Dr. Meyers, we have several questions addressed to you. There is a long standing use of the terms "determinate" and "indeterminate"; what advantage are there in the terms "homophyllus" and "heterophyllus"?

MARTIN MEYER: I used "heterophyllus" because it is the term Kozlowski, whom I cited, used and which I think best describes this type of growth; "homophyllous" is my term, which is opposed to heterophyllous.

MODERATOR SHUGERT: In view of the data on nutrient uptake in winter and of winter root activity of conifers and other woody plants, would Dr. Meyer comment on the best time to fertilize — between summer only or a constant maintenance of a good nutrient level?

MARTIN MEYER: Between Juniper and Taxus — I think it is important to maintain a constant level with Juniper because they respond all the time; with Taxus you would not have to be so critical in maintaining a constant maintenance level, but both plants would benefit from it.

MODERATOR SHUGERT: Sid Waxman, have you tried using high concentrations of IBA as a quick liquid dip on your pines and have you used Captan as a synergist?

SID WAXMAN: No I've only used Hormodin No. 3 and Captan as a fungicide; I don't know if it has any synergistic effect.

MODERATOR SHUGERT: Another question for you, Sid; have you done any work with witches' brooms other than pine and hemlock?

SID WAXMAN: No.

BRUCE BRIGGS: I assume it is generally held that hormones cause witches' brooms; this was reported at the International Botanical Congress in Seattle this year. Do you know of any tissue tests that have been made to determine if the tissue retains this original high hormone content in later growth?

SID WAXMAN: We tested it by the mung bean bioassay and found that the witches' broom seedling did have more biological activity. Also the growth on a witches' broom tends to be

upright and I think this is related to auxin content as has been demonstrated for fruit trees.

GERRY VERKADE: Sid, someone told me they could root pines by sticking them in a potato, Is this possible and have you heard of it?

SID WAXMAN: Anything's possible, but I haven't heard of it.

CHARLEY HESS: I've heard of that but it was rose cuttings stuck into potatoes. Potatoes are high in phenolic compounds like iso-chlorogenic acid and there may be a far-out chance that it may play a role. It corresponds to the old Dutch treatment of splitting a cutting and placing a wheat grain in it and supposedly getting some stimulation, but it's not very promising commercially.

ROGER EWLINGER: You can stimulate rooting of some of the difficult to root pines, specifically *P. ponderosa*, by sticking the cutting into a germinating acorn.

MODERATOR SHUGERT: Larry Carville, in preparing your beds for softwood cuttings, how do you take care of the 4-inch strip that the Howard Rotovator does not get?

LARRY CARVILLE: We recently acquired a small front-tilling Model of Simplicity tractor which we use to trim up the sides.

MODERATOR SHUGERT: What are some up-to-date sources of information of plant culture work — procedures, media, etc.?

CHARLEY HESS: There were two papers on tissue culture of plant tissues given at the Western Region meetings which are in Volumes 16 of the Proceedings; one was by Tosh Murashige and another by Wes Hackett. Both of these have several references listed at the end of them (See Vol. 16:80-92). There is a book, *Proceedings International Conference on Tissue Culture*, edited by Philip White and published by McCutchen Publishing Corp. Berkeley, California in 1965 that has many articles with hundreds of references. A large number of articles which involve tissue culture methods are in various publications such as the American Journal of Botany, Plant Physiology, Physiologia Plantarum, and the Bulletin of the American Orchid Society.

MODERATOR SHUGERT: Joe Cessarini, why did you use 4 mil clear plastic rather than 6 mil white?

JOE CESARINI: I began covering them before I knew of the white plastic. The clear works, so why change it?

MODERATOR SHUGERT: Why do you pot your rooted Japanese maple cuttings in perlite and peat?

JOE CESARINI: We are not potting them, we are sticking directly into the pots for rooting. In potting, if you break any of the roots diseases get in and you lose them.

MODERATOR SHUGERT: We now have questions not directed to any particular person. Is there any indication that CO_2 enrichment of air aids rooting of cuttings?

BILL SNYDER: One of our students at Rutgers has been doing some work on CO_2 enrichment and the results, at best, were inconsistant.

PETER VERMEULEN: At Boskoop they found that CO_2 under poly was much higher than under glass frames.

BILL SNYDER: About 2 years ago there was a report from the West Coast concerning the CO_2 level in completely enclosed poly frames and they found that during the middle of the day, when the plants should be photosynthesizing the most rapidly, the CO_2 content in the cases was reduced to a level where probably little photosynthesis was going on.

CHARLEY HESS: There is also an article on carbonized mist in the last issue of the Proceedings.

MODERATOR SHUGERT: Has anyone tried Off-Shoot-O on azaleas and rhododendrons?

ANDY ADAMS: We used it on our entire azalea crop this year and it did a good job, using the recommended rate on the bottle for azaleas.

DICK BOSLEY: We used it on *R. kaempferi* this summer and it worked very well, but read the label and follow the directions. It will work on rhododendrons applied at about the time the new bud is just long enough so that the scales are just starting to open up. The stage of application is much more critical than for azaleas. It is seldom that they break uniformly enough and have enough of them at the same stage to make it practical to use.

MODERATOR SHUGERT: Someone asked what does it do?

BRUCE BRIGGS: It burns out the meristem and if the dilution is right there will be little or no burning of the other foliage. We hope in time to be able to pinch conifers and other broadleaves with it but a lot more work is needed.

JOE CESARINI: It does a wonderful job on cotoneaster.

MODERATOR SHUGERT: Has anyone working with Benlate noted any problems such as chlorosis which might indicate an accumulative toxicity?

DICK BOSLEY: We've used it on rhododendrons, incorporating it into the rooting powder at 2 and 4% actual, and as a "water on" material and have noticed no problems; this is our second year.

JIM CUMMINS: I reported using Benlate as high as 6000 ppm, which is about 10 times the recommended dosage; we have observed no post-application problems whatsoever.

MODERATOR SHUGERT: What causes necrotic damage to the ends of cuttings when a high level of hormone is used?

CHARLEY HESS: Some of the cells are killed; as the concentration is increased the roots come out higher on the stem instead of at the base; as it gets too high, the base of the cutting is killed and the roots come out higher up the stem.

MODERATOR SHUGERT: Does wounding increase IAA or are there other hormone actions from wounding?

CHARLEY HESS: I don't know of any evidence of an in-

crease in IAA but there is evidence of a substance formed from wounding and this material does stimulate cell division. This work was done with bean pods and when the inside of the bean pod was scratched tissue proliferated. From this, traumatic acid was isolated and identified. I tried it on cuttings and it did not stimulate rooting. I talked to the people in Boskoop who tried it as a graft union stimulator and they found no response. So what goes on when you wound a cutting is still pretty much an unanswered question.

MODERATOR SHUGERT: What are the disadvantages of wounding Taxus cuttings?

JIM WELLS: Wounding of Taxus does not seem to improve rooting. You can "burst" roots out of the more difficult ones by treating them with the stronger hormones, like 2,4-D, but wounding is not necessary.

MODERATOR SHUGERT: What is the best understock for *Betula chinensis*?

JOERG LEISS: You can graft it on *Betula verrucosa* (*B. alba*), but we grow it from seed.

MODERATOR SHUGERT: Has anyone tried establishing a leader on grafted or cutting-grown blue spruce by continual pruning rather than by staking?

CASE HOOGENDOORN: There used to be an old Dutchman to whom I sold one-year grafts; what he did was to line them out and let them get established, then the next year he would cut them back. This would force buds — when you force buds you get a leader.

JOE CESARINI: The ability to establish a leader depends a lot on the scion you graft. I find that 'Hoopsi' is one of the best to form a leader.

MODERATOR SHUGERT: How compatible is *Cornus kousa* grafted on *Cornus florida?* The consensus of opinion in the room says it is compatible.

DON SHADOW: We have budded it for the past 8 to 10 years and have had no trouble at all.

PETE VERMUELEN: We have plants that have been grafted for 25 to 30 years and have never noticed any problem.

MODERATOR SHUGERT: Please give one or more positive ways to identify White Ash from Green Ash.

ROY NORDINE: It is difficult to determine when they are small but when the trees are older, Green Ash has an irregular branching habit, forming an irregularly shaped plant, while White Ash is very symetrical. In the fall of the year White Ash is the only one that turns purple; Green Ash turns yellow or brown.

TOM PINNEY: Is there a way of identifying them from the buds or seeds?

HARRY HOPPERTON: There are easy methods: buds on the Green Ash come to a point like a needle while those on White Ash are fat and round. Also Green Ash has a little longer and more pointed leaf than White Ash.

JOERG LEISS: The samara wing of Red and Green Ash both extend almost all along the edge of the seed while the samara wing, of White Ash only goes to about a quarter of the seed and is only half the size of that of Green or Red Ash.

MODERATOR SHUGERT: Last year Bill Curtis said that *Pinus contorta* could be used as an understock for all pine grafting. Did he really mean that? It's hard to believe that one species can be used as an understock for all pines.

BRUCE BRIGGS: One of our nurserymen, John Spawn, has used it on all of the pines I know of. There may be some he can't use it with but I'm not aware of these.

HARRY HOPPERTON: I have probably 30 pines grafted on *P. contorta* — some of them with almost 6-inch caliper; the grafts are a saddle and they're all perfect.

MODERATOR SHUGERT: How does one germinate *Cladrastis lutea* seed?

BILL FLEMER: Like other legumes it doesn't have an internal dormancy problem; it merely has a hard seed coat. We keep the seed dry over the winter and then put them in hot water, 120°F, until the seeds swell, usually 24 to 36 hours. They are taken out of the water and dried so they don't stick together, then are sown in nursery rows. We put double lath screen over them because the seedlings are susceptible to sun scald at their base. After they are up quite well we take one lath screen off.

CHARLEY HESS: Do you keep them in hot water, or is this just the starting temperature which gradually cools.

BILL FLEMER: This is just the starting temperature.

MODERATOR SHUGERT: When using a hot water treatment on any seed, try it on a small sample first — not the whole lot, because you can lose all your seed if the water is too hot.

LEN STOLTZ: Along with your suggestion Ralph, I'd suggest that several small lots of 100 or 200 seed be treated at different temperatures and times and then sown in a pot or flat in the greenhouse to determine which treatment gives the best germination percentage. This can be done a month or two ahead of the time you intend to sow them in the nursery.

MODERATOR SHUGERT: What is the required amount of water per week for maximum summer growth of plants in cans using a soil, sand, peat mix?

JOHN MCGUIRE: I don't think you can make a general rule since it will depend upon transpiration rate, temperatures, size and kind of plant in the can, wind velocity and other factors.

MODERATOR SHUGERT: Has anyone noticed any effect on rooting when stock plants have been treated with simazine or other herbicides?

JOHN EICHELSER: We've been taking cuttings from rhododendrons treated with Simazine for quite a few years and haven't noticed any decline in rooting from this cause.

PETER ORUM: We have been using simazine for a long time; we've used it on stock plants and have not seen any reduction in rooting percentage, but I don't advocate continuing to apply simazine indefinitely.

MODERATOR SHUGERT: What is the optimum pH to maintain the most desirable winter color of white pines?

TOM PINNEY: Our pH is not optimum — it is 8.0 with a dolomitic limestone base and it gives us problems. However, in the western and central parts of Wisconsin white pines grow very well and the pH is around 6.0 but there are more complications involved than just pH.

LESLIE HANCOCK: The pH level for white pine is extremely important; our pH runs about 6.0 and we have beautiful ones. It needs a medium-acid soil with good drainage.

HARVEY GRAY: I've checked into this a little and, as was pointed out, more than pH is involved. I think there is a correlation between the pH level and the micro-organisms of the soil which make the elements of nutrition available.

MODERATOR SHUGERT: Is ground hardwood bark comparable to pine bark as a container-growing medium?

MARTIN MEYER: We are beginning to study the use of hardwood bark, particularly beech and oak, and it does have a pH problem in that the pH is much higher than found with fir and pine bark.

MODERATOR SHUGERT: What is a fair price for unground hardwood bark per yard or ton and what type of grinder is suitable for grinding and what is the cost per yard for grinding?

MARTIN MEYER: The paper companies have tremendous quantities of this material available and it is ground a little because they shred it somewhat in stripping it off the logs. I don't know what a fair price would be.

DICK BOSLEY: We are using hardwood bark, but if I could get pine bark I would prefer it. As far as a fair price — they ought to pay you to take it away. We get ours free at the site but the trucking and handling charges are in the range of $3.00 per yard.

GERRY VERKADE: We've grown some sweetgum in hardwood bark at a pH of 7.2 and haven't had any chlorotic conditions. Freight on the bark costs us about $2.00 per yard in bulk; it is ground but we don't want much dust and fine particles. This also needs more work.

ANDY KNAUER: We paid $45.00 for a 15 to 18 yard load. To break it down you can use an ordinary wood chipper; one with a serrated blade works very well. You get considerable dust but also a tremendous amount of pathogens.

BILL FLEMER: Harold Nichol at the Green Leaf Nursery uses ground hardwood bark exclusively as the organic compound of their canning mix. I believe he said he paid 75c/yd delivered and grinding costs another 75c. They use a big W. W. grinder.

LEN STOLTZ: We intend working with this material at Kentucky and some of the problems we foresee is the fact that hardwood bark is almost always a mixture. Bark from hardwood logs shreds off when the bark slips giving a stringy product, difficult to grind. We want to look at the barks individually to determine if there are any inhibitive or promotive effects from their use.

MODERATOR SHUGERT: Who is using cost accounting, what are the results, and do you make more profit? Tom Pinney, this is addressed to you, sir.

TOM PINNEY: I believe most of the large nurseries are using it because they have got to know their costs. I know of several that I've talked to that are using it — some have it attached to computers. Ours is laboriously done by hand methods yet, but we are getting ready for data processing procedures. In our case it has positively increased profits.

MODERATOR SHUGERT: Another question, Tom, along these lines that you may wish to comment on. How large does the operation have to be for a cost analysis system to be feasible, and can it be readily adapted to a multi-phased nursery operation?

TOM PINNEY: In our case we are complicated by the fact that we are multi-phased. We are not large but we have found it feasible to separate them. I suspect it would be much easier to do a cost analysis system for a small operator. The problem in a medium-size nursery is to get your employees enthusiastic about it. I think the most important part of Knox Henry's talk was that he was talking in terms of a total system; you must look at all of the inputs and all of the outputs.

JIM LAW: I agree with Tom that it is probably easier to use on straight function nurseries. I think the important thing here is that it is another tool; it's a way of measuring what you are doing, where your labor cost is, where your material costs are, and what some of the other factors are.

MODERATOR SHUGERT: I've seen this system in operation for the past nine weeks both as a monthly cost analysis and, most important, as a weekly breakdown of plants sold to date, size, last year's sales, number of plants yet to sell, etc. It's amazing the amount of information immediately available. For those that have it, they wonder how they did without it —another excellent management tool.

MODERATOR SHUGERT: What is the best cover crop to rebuild old nursery land and why?

VINCE BAILEY: We have a 9-year rotation with 6 years in sod using brome-alfalfa because it opens up the soil down deep and gives good drainage to our heavy soils. We don't remove any of the crop but use a field chopper and plow it down in July of the third year. Then we add 20 tons of barnyard manure before planting each crop.

BRUCE BRIGGS: Has anyone used corn?

CASE HOOGENDOORN: Yes, I used silo corn just after the war to get land back into production. This grows about 8 feet tall and we had few weeds to pull. About the middle of August we chopped it and had about 3 inches of green manure, then we plowed it under and planted rye in September; this took care of our dog-grass problem and it improved the soil.

MODERATOR SHUGERT: That completes the Question Box Session for this year. Thank you for your very excellent participation.