

MR. A. F. DODGE (Ames, Iowa): Out lots of cedar are quite small, and I will go along with the use of polyethylene bags with a moderate amount of medium with the seed.

MODERATOR STEAVENSON: The last speaker of the afternoon is Mr. Rodney Bailey, Vince Bailey's nephew, and Gordon Bailey's son. He has been handling the nursery propagation the last couple of years. We are fortunate that we have Rod here with us to discuss "Over-Wintering of Softwood Cuttings under Controlled Temperature," which I know they have been doing a great deal of work on. Rodney Bailey!

Mr. Rodney Bailey presented the discussion on the procedures used to overwinter softwood cuttings in a controlled temperature, nursery storage.

### **OVERWINTERING OF SOFTWOOD CUTTINGS UNDER CONTROLLED TEMPERATURES**

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The present day propagator has been given the knowledge, through recent research, of how to root softwood deciduous cuttings at a low cost. This know-how has been spread by our universities and such organizations as the Plant Propagator's Society. We have all cut our costs tremendously by adopting these new methods.

I feel that the propagators work does not stop at putting roots on a cutting. If he can not produce a finished plant economically, he is soon in financial trouble in this very competitive world. The transfer of this rooted cutting into the field has been a challenge to all of us. Many are getting good stands by placing them in bands or pots for a time and then transferring them to a field. There are a number of variations of this procedure but it is very costly in time and labor.

In order to reduce this high labor cost, we started six or eight years ago to transfer these rooted cuttings directly into the field. We were well satisfied with the results in all ways. The stands were good and growth was surprisingly vigorous. The storage over winter was in trays packed in peat. Several years ago we tried storing in polyethylene in a modern refrigerated and humidified cooler. I give you this background for our experience to point out our reasons for searching for a better method of getting the finished plant at low cost.

Following is our procedure that we have found to be most economical for producing quality stock. The plants are allowed to mature naturally in the mist beds or the greenhouse benches. Probably one of the reasons for our success with this method is the attention we give to the proper hardening off of this rooted cutting. In my estimation, nothing will take the place of this natural process. The chemical defoliant or mechanical means of leaf removal reduce the vigor of the plant to some

extent. I can not place too much emphasis on this natural hardening off the rooted cutting for success in this method of storage over winter. If the plant were to be potted immediately upon removal from the propagation medium, we would place much less importance to the matter of maturity.

During the month of November they are removed and placed on a sheet of polyethylene with, of course, the leaves all removed and straightened out as if ready for bunching. The sheet of poly is rolled up with one edge folded over the roots. Use a large enough sheet to completely enclose the plants. The bundles are tied with string or rubber binders. We place 300 to 500 per bundle which makes a convenient size to handle. There is no packing of any sort placed around the roots. This is another saving of labor as there is absolutely no need of any moisture holding material inside these bales. The very small amount of moist sand clinging to the roots and the moist plant itself is sufficient to prevent any desiccation.

These bales or bundles are then placed in a room with temperatures of 33 to 34 degrees F. The relative humidity is held at 96 per cent. This controlled humidity of the storage room is further insurance against any drying of the bales. One might ask how we prevent fungus growth on these plants. There has never been any fungicide used and we have not seen any evidence of growth at any time on these plants. This is, I am sure, due to the low constant temperature of 33 to 34 degrees F. held at all times. Most parasitic types of fungus require a much higher range of temperature. The usual labeling and records of location are kept. It is just as simple as that — there is nothing complicated about it.

At planting time in the spring these bales are taken to the field and handled in the usual manner. The medium and larger growing varieties are placed in 44 inch rows while the dwarf varieties are put in two foot rows. As you can see the handling costs are very low. Enough plants can be put in a pickup truck to keep a rather large crew busy all day. Our production is between three hundred and four hundred thousand annually. The resulting stands are very satisfactory.

I have here a small bundle of plants to show the method of wrapping and the size of the cuttings used. They will be on the table for you to examine at your leisure. This method of storing rooted deciduous cuttings is way past the experimental stage with us. We have had consistently satisfactory results for the past four years and we are very happy with it.

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MODERATOR STEAVENSON: Thank you, Rod. We have time for some questions for Rod.

MR. HANS HESS: In your test with this method of storage, do you confine it entirely to deciduous material or have you done it also with evergreen material?

MR. BAILEY: So far it has just been with deciduous material. One thing I might add here, on our evergreen cuttings, which we take about the 10th of November, we will go through and take all varieties



and store them in our cooler. We can then take them out when needed in the greenhouse. We don't put them in polyethylene. We merely put them in wet moss and at a controlled temperature and humidity.

MR. FRED NISBET. Do you have any light in that cold room or is it entirely in the dark?

MR. BAILEY: It is in the dark pretty much except once in a while during the working hours when the lights are turned on. This cooler is also used for storing shrubs and other types of material.

MR. PHILIP M. FISHER (Chicago, Illinois): We only root one type of softwood cutting and that is blueberry stock. At the present time we leave them right in the ground bed. We have already put on about an inch of sod sprinkled all over the cuttings. We use the wire arch of about six inch mesh netting in the summer to support the polyethylene and Saran cloth is added in the winter. We cover that whole arch with pine bows. The whole thing freezes solidly and there is still some frost in the ground when we shake them out in the spring. As of the last two years we have had no loss and find it very satisfactory and a very cheap method. We just set the cuttings out in the nursery in the spring.

MR. BOB DE WILDE: You mentioned 33 and 34 as your temperatures. Is this extremely critical? Would 40 degrees do?

MR. BAILEY: Well, I wouldn't say that it is absolutely necessary to have 33 or 34 degree temperatures but we have had very good results at that temperature.

MR. DE WILDE: Have you had bad results at 40 degrees?

DR. CHARLES HESS: Bill Stoddard and I actually worked with this experiment. This 34 to 38 degree temperature was really essential because of the fact that when you got to higher temperatures you got into trouble with fungus growth. I think you mentioned this before at a lower temperature. This low temperature was not high enough to allow growth of the fungi that would cause trouble. The lower temperature, the closer it is to freezing, the slower all the plant processes are, and therefore, the longer they can be stored without changing the plant's internal condition significantly.

MR. HOOGENDOORN: Do you roll those cuttings in sheets or do you place those in polyethylene bags?

MR. BAILEY: We use just sheets of polyethylene, which are rolled, overlapped, and tied.

DR. MAHLSTEDDE: We have had cuttings of the Maney juniper in polyethylene bags in groups of 15 up to 100, for as long as a year. As of this time we are just starting to take them out now at intervals of 60 days, and potting them to see how they will perform. We intend holding some of these for as long as two years.

Another thing we are doing with this storage technique is to take *Taxus* cuttings in December, flush them, and hardening them in a similar method to what Rod has described, by putting them in storage two or three months. We then store them another two months and put

them out in beds. We are interested in seeing if we can get a little extra growth by this conditioning sequence.

MODERATOR STEAVENSON. We have time for one more question if somebody has one.

MR. HOOGENDOORN. Has anybody experimented with carrying over evergreens, like arborvitae, juniperus or any evergreen? What I mean, like evergreens we propagate in summer under mist. Have you taken those up in the fall and carried them over. If so under what temperatures or humidity conditions?

MR. HANS HESS: I carried out one experiment a year ago last fall, taking samples of a number of evergreen seedlings and also *Taxus* cuttings, arborvitae, and some of the deciduous material. These were placed in polyethylene bags, tied shut with an elastic band, and were put in ordinary refrigerator in which the temperature held at approximately 34 degrees. They were in there from November until the frost went out in April and were planted outside. All of the evergreens which I tried came through 100 per cent. The varieties of the deciduous material, that is, deciduous seedlings which did not respond satisfactorily were Pin oak, which was a complete loss, Mountain ash, which gave us a 50 per cent stand, and hawthorn, which also gave us about a 50 per cent stand. Viburnums responded very well.

MODERATOR STEAVENSON. We will stand adjourned until 8.00 o'clock p.m., at which time Dick Van Heiningen will be moderator for the Plant Propagators question box.

Let me remind you again that Roy Nordine wants to meet with the arboretum people at 5:30 for a supper meeting.

The session recessed at 4:40 o'clock.

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