

ous skill as a propagator with many difficult subjects. Now may I present Mr. John Vermeulen, John Vermeulen and Son, Inc., Neshanic Station, New Jersey, who will address us on "Propagation of *Ginkgo biloba* by Cuttings." Mr. Vermeulen!

MR. JOHN VERMEULEN (Neshanic Station, New Jersey): I will start by saying that I don't have much to say and I won't talk very long. This is a new subject and I do think that there are people on the floor that maybe know more about it than I do. I hope we can open the floor up for discussion after I introduce the subject.

Mr. Vermeulen presented his paper on the techniques used at his nursery to propagate ginkgo from cuttings.

PROPAGATION OF GINKGO BILOBA BY CUTTINGS

JOHN VERMEULEN
John Vermeulen and Son
Neshanic Station, New Jersey

When Martin Van Hof asked me last Fall if I could fill in with a paper about the propagation of ginkgos I told him that I would try and explain our experience with this plant. We started with the propagation of male ginkgos about ten years ago, but due to several more important things we were trying out we did not take a serious interest in it until the summer of 1957.

As you all know the ginkgos are readily propagated from seed. In this seedling population you get both female and male trees. These female ginkgos produce a lot of seeds which, when they do drop off in the early fall and are stepped upon, leave a very unpleasant odor. To eliminate this serious problem many nurseries have been grafting or budding the male ginkgo. However, as with many other plants, the question of ease and expense of production arose. If there was an easy method of propagation the male ginkgo could be sold at a more reasonable price and produced in larger quantities.

We, as propagators of small plants, could not think of planting out stock for budding or going to the added expense of grafting. The rooting of cuttings was therefore the solution to this problem. As we only had a very limited access to propagating material, our trials were only on a very small scale the first year. As we had been checking on many more trees in order to determine their sex we increased our trials as we went on. It takes several years for the ginkgo to mature and to bear seed so we had to check older trees for several years to be sure that they were the male form.

In propagating the ginkgos there is also the consideration of the type of tree from which the cutting wood is cut as well as its location and the type of soil in which it is growing. As far as we have been able to find out we think it is the type of tree which makes the difference in the rooting.

This, I think is as far as I can go in telling you about our results. I hope that through questions we all can learn a little more. There are

many things I would like to find out from others who have been working on this particular plant. Following is a completed record of our results from 1957 through 1960 (tables 1 and 2).

Table 1.—Effect of various rooting compounds on the rooting of male, Ginkgo cuttings.

Number	Treatment	No. Rooted September 4
13*	Hormodin #3	11**
13	IBA 1%	10
13	IBA 2%	10
13	Cut start 7	0
13	Cut start 9	1
13	Cut start 11	8
13	Cut start 13	8

* Cuttings stuck July, 1957

** All cuttings were rooted lightly.

Table 2.—Effect of year, variety and rooting treatment on the rooting of Ginkgo biloba cuttings.

Date Stuck	No Stuck	Type	Treatment	No Rooted	Days	Degree of Rooting
7/29/58	150	Male	Hormodin #3	75	58	Fair
7/21/59	150	<i>G. Fastigiata</i>	Hormodin #3	122	55	Fair
7/21/59	80	<i>G. pyramidalis</i>	Hormodin #3	7	55	Fair
7/21/59	150	Male	Hormodin #3	69	55	Fair
7/21/59	50	2 yr. wood	Germain	21	55	Fair
7/13/60	315	<i>G. fastigiata</i>	Hormodin #3	216	52	Fair
7/13/60	65	<i>G. pyramidalis</i>	Hormodin #3	17	52	Fair
7/13/60	16	<i>G. pyramidalis</i> #2	Hormodin #3	9	52	Fair
7/13/60	85	Male	Hormodin #3	46	52	Fair
7/13/60	225	Male	Hormodin #3	131	52	Fair

All cuttings which were not rooted in 1958, 1959, and 1960 were put back in the bench and left there until the following summer. All these rooted well. The rank of light means each cutting had two to four roots and those which were ranked as fair had four to seven roots per cutting. One more remark, I think if we would leave all cuttings in the bench until late spring we would get a near perfect stand. However, as we like to turn our stock over as soon as possible, we still take up the stock in September and pot what is rooted and restick the others.

All cuttings were made from the current year's growth which is taken as close to last year's wood as possible. Cuttings were then placed in a mixture of 80 per cent sand and 20 per cent styrofoam which was firmly packed down. This was kept under intermittent mist until the cuttings were rooted.

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CHAIRMAN STEAVENSON: Thank you very much, John. Now do you have questions for John, or would anyone care to comment on the rooting of ginkgo? If so, we would be very happy to have them.

We know some of our West Coast friends are apparently doing a lot along this line on the coast. Maybe they would like to comment on this subject. Harvey, John said you might have a few comments on the rooting of the ginkgo.

PRESIDENT TEMPLETON: Yes, we have tried rooting male ginkgo, for the first time about four years ago. We found it was extremely difficult to accumulate any quantity of cuttings. If you go to a big tree and it looks like it has plenty of cuttings on it, when you start looking there are only a darn few there. The only usable cuttings are the terminals. All the rest are borne on little short spurs. If they do root they are not going to grow long. It is a matter of going over the whole tree, which might be 75 feet high and getting a few here and there. To get any quantity from an established tree you would have to cut it back and let it make a lot of new shoots.

One year we put in about 6,000 cuttings, one bed of them. We got a good stand. I would guess 4,000 out of the 6,000 rooted. As we do with all our cuttings, we left them there over the winter. They rooted in the soil. The next year they didn't grow one bit. The second summer after they had been rooted they grew reasonably well and wound up between 6 and 24 inches in height.

Now that is a little discouraging and I want to ask John what his experience has been with the growth of these rooted cuttings after he gets them rooted. Do they make a satisfactory tree?

MR. VERMEULEN: Whatever we potted did very poorly the first year, as you said. The second year they made fairly good growth. What we potted early last summer did much better than what we potted later in the summer. Those potted six months later are bigger plants than ones potted from summer cuttings.

There was one more thing we have tried. The first year we used five different rooting powders. We found, however that Hormodin #3 has given us the best results, and we think it is better for everything.

CHAIRMAN STEAVENSON: Are there any more questions?

PRESIDENT TEMPLETON: Yes. I might make another comment on the use of rooting hormones on ginkgo cuttings. We see no beneficial effect, at least if we put on too strong a hormone, such as two per cent indolebutyric acid in alcohol, it simply kills the end of it. If we put Hormodin #3 under our conditions, it often kills the base so we get no rooting. We also made tests with Hormodin #2, which is not too detrimental but certainly showed no benefit. We get just as much rooting from no Hormodin at all.

MR. FRED NISBET: I think the reason we haven't used more ginkgos is the fact that there aren't enough males. Another thing, don't plant them if you have any deer in the vicinity. Whether or not they really browse on the buds and foliage I am not sure yet. I suspect it, but that makes little difference inasmuch as by rubbing their antlers on the stems they are rubbing right through the cambium and girdling the tree.

CHAIRMAN STEAVENSON: Thank you for your observation. They are propagating a lot of ginkgos out there on the West Coast. Somebody ought to be able to tell us how they are propagating these.

PRESIDENT TEMPLETON: I suppose this is subject to correction by those people on the West Coast who are actually doing it. This is my impression of what they told me. They are grafting ginkgo seedlings in containers, usually in January. That isn't too critical, but they simply make an inverted cleft graft above the soil surface and put them back in the greenhouse. They can also be put out where they can be covered with polyethylene or under shade so the scion doesn't dry up too rapidly. It is easy to get a high percentage with no trouble at all.

MR. VERMEULEN: Have you found there is any difference in the type of tree you get your cuttings from? We get different results from different plants. I was wondering if anybody else did

MR. RALPH ZIMMERMAN (Cincinnati, Ohio): We bought some Autumn Gold from the West Coast and also some ginkgo from the Princeton Nurseries. The Autumn Gold roots real well but the Princeton won't root at all. I don't know why, because we used the same kind of cuttings and everything.

CHAIRMAN STEAVENSON: Thank you, Mr. Zimmerman. Autumn Gold is a clone they are working with on the West Coast which has been developed by the Saratoga Horticultural Foundation. It is supposed to be a particularly nice male type, with good yellow autumn foliage and other desirable characteristics. It is available, by the way, in the West Coast nurseries.

Our next speaker I think is well known to all of you and to nurserymen and nursery groups over the country. I know he supplies a good deal of stock to other nurserymen for redistribution, and it is my particular pleasure to give you Richard Van Heiningen of Van Heiningen Nurseries, Deep River, Connecticut. He will speak on "Winter Propagation in Outside Frames with Electric Cables." Dick Van Heiningen!

Mr. Van Heiningen discussed the procedure he uses to root cuttings in outdoor frames equipped with electric cables.

PROPAGATION IN FRAMES USING ELECTRIC CABLES FOR BOTTOM HEAT

RICHARD VAN HEININGEN
*Van Heiningen Nurseries
Deep River, Connecticut*

I would like to give you a little history of our propagation method so that you can see how we sort of walked into the electric cable method of propagation

My father, who ran the Evergreen Nursery Company in Wilton, used frames exclusively for the propagation of evergreen cuttings. He was supplied in the wintertime with horse manure, until Bordens and Sheffield Farms turned from horses to trucks. When there was no man-