

vitae. For the yews I think we will depend on winter propagation primarily.

MODERATOR FILLMORE: We thank Mr. Ferguson, and we will go on to the concluding speaker on this section, Mr. Donald Wedge, Wedge Nurseries, Albert Lea, Minnesota.

Mr. Donald Wedge presented his paper entitled, "Summer Propagation of Evergreens Under Mist." (Applause)

SUMMER PROPAGATION OF EVERGREENS UNDER MIST

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An article on propagation under mist by Edward J. Gardner, in the May 1st, 1941 issue of the American Nurseryman, was responsible for our starting mist propagation. From that date on, until the 1950's, when many articles on the subject started to appear, we were on our own, isolated you might say, as to what others were doing. The evolution of this idea with us resulted in a mist system which differs in some respects from any other system with which I am familiar.

In 1941 and 1942 we experimented on a small scale in a covered cold frame, using a constant spray from Hudson type spray nozzles. The results were just encouraging enough to continue experimentation.

In 1943 and 1944 we experimented with a small, head-high structure, completely covered with lath shade lencing, using a continuous spray from short throw greenhouse nozzles, fitted on two stationary pipes hung along the upper two sides. This time the results were more satisfactory and warranted the added expense of setting up for increased production the next year. Today we are still using the same basic set-up used in 1945. In describing it to you remember that it was devised 14 years ago when we had to make our own controls, and adopt available mist nozzles. This system has given us good results over the years and consequently we have continued to use it.

We now have two identical propagation houses, side by side, 220 feet long and 26 feet wide, with a $\frac{3}{4}$ inch pipe line running the length of each house. This pipe, powered by an electric motor, oscillates a 150 degree turn every second, covering four, 4 foot wide beds. This line has Skinner, 70 degree deflector greenhouse nozzles every 4 feet, which makes a 50 degree fan of mist which settles down on the cuttings like a fog. Each nozzle takes care of 64 square feet of bed area.

The interval timer, which controls both the pipe oscillator and the solenoid valve in the water line, was made out of Fairbanks Morse stoker timers, on which we can change timing discs. We exclusively use a disc which is notched to give us one minute of mist out of every five. Hooked in ahead of this in the system is a day-night clock set to come on at 6 A.M. and to go off at 9 P.M. until about August 1st, when the mist is withdrawn gradually until by September 15th it is only operating a few hours during the middle of the day.

We used an electronic leaf the first year they were offered, but found it acted too erratic under our setup. Maybe some of the new developments in electronic leaves or softer water would work more satisfactorily.

The structure around these beds was built with a framework of pipe and industrial rails. The seven foot sides are covered with lath shade fencing to break and diffuse the winds. We soon found top shading was also necessary.

Washed plaster sand is used as the rooting medium. This sand has been changed every 4 or 5 years, although it could be used longer since we have had no damping-off or other fungus troubles.

In planting, we use a four foot long oak planting board marked with 25 notches which is the spacing we give our cuttings. A wide slicing blade is run along the planting board to form a deep groove in which to insert the cuttings. We formerly firmed the sand around the cuttings by tapping the planting board with a rubber headed mallet. We have since found that this operation can be eliminated. One man plants from 8 to 10 thousand cuttings per day.

The planter works in a light, canvas covered framework which protects him from the mist. This can be easily moved from the inside after planting every 3 feet of bed which allows the new planted cuttings to receive benefit of the mist.

The only problem we have in our setup is that we would like the mist line to operate more frequently and for shorter periods of time, say, 10 to 15 seconds out of every 2 minutes. The notches on our present timer disc are almost as close as they can be made. We have therefore planned to install new automatic timer controls this coming season. Because of the length of our beds it will be necessary to feed the mist line from both ends, in order to secure more even distribution within the frame.

Since all the cuttings we root are used to produce finished plants in our own fields and since they are not for sale as lining out stock, the shrubs which root more quickly and strongly are transplanted directly to the open field in August and early September. The evergreens and slower rooting shrubs remain in the beds over winter and are given a good covering of marsh hay for winter protection.

Between May 1 and 15th, the rooted evergreen cuttings are lined out 4 to 5 inches apart in rows two feet apart, under overhead irrigation. These plants are left in place for two growing seasons, where they develop into 12-18 inch heavy liners. They are then transplanted to the open field, check rowed $3\frac{1}{2}$ feet each way to permit cross cultivation and where they are ready to grow into finished stock.

The yews are left in the beds until early June, as most of the rooting seems to take place in May. I have been wondering if we would have better success if cuttings were inserted in the fall or early spring?

Now as to more specific information on our evergreen propagation. Cuttings are taken in the period from June 20th to July 15th. We prefer the larger cuttings, 6 to 8 inches in length, which are stuck 2 to 3 inches deep in sand. On arborvitae we have had the best rooting where

some of the foliage is also in the sand. On junipers and yews the lower foliage is stripped off. The yew cuttings were made with some 2 year old wood at the base.

Pfitzer juniper, Siberian arborvitae and yews are wounded with a razor blade wounder and treated with Hormodin powder #2.

Pyramidal, Globe, and American arborvitae; Savin, Andorra, Golden prostrate, and Bar Harbor junipers are rooted without any treatment.

After hearing and reading reports of 90 to 100 per cent rooting in these evergreen varieties, I hesitate to inform you of the percentage of rooting we are able to secure. I can report that we get these high percentages in many of our shrub varieties. The percentages I am going to give you are based on the counts as taken in the early fall in the 1 year transplant rows rather than the usual comparison of number of cuttings actually rooted compared to cuttings originally stuck.

Table 1.—Field survival of various types of evergreens.

Stand	Plant Material
50 to 65 percent	Pyramidal arborvitae Andorra juniper Savin juniper Golden prostrate juniper
40 to 55 percent	Globe arborvitae American arborvitae Bar Harbor juniper
30 to 45 percent	Siberian arborvitae
20 to 30 percent	Pfitzer juniper
10 percent	Taxus cuspidata*
5 percent	Mancy juniper
*Considerable winter killing	

I realize that we have a lot to learn in connection with timing and the position on the plant from which to select propagating wood. We need to do more careful experimentation also, in order to find the best root-inducing chemicals, wounding treatments and rooting mediums for each variety of plant we propagate. Thank you for your attention.

MODERATOR FILLMORE: We thank Mr. Wedge very much, indeed. I wonder if there are any questions now on the first portion of the program which had to do with the rooting of conifers under intermittent mist.

MR. MARTIN VAN HOF (Newport, R.I.): I would like to ask Mr. Wedge if he takes one-year old or two-year old wood?

MR. WEDGE: We try to select one-year old wood.

MR. VAN HOF: What kind of stands did you get with Pfitzer juniper and when did you stick them?

MR. WEDGE: We had a 20 to 30 per cent stand and they were put in the latter part of June or early July.

MR. VAN HOF: You must get earlier growth than we do in Rhode Island, because we couldn't possibly put them in at that time, since they are too soft. We stick them around the middle of July and probably a little later, and we have about a 90 per cent stand with outdoor, intermittent mist.

MR. JACK BLAUW (Bridgeton, N.J.): Did I understand you to say that you used sand for four or five years without changing?

MR. WEDGE: Yes, and we had no fungus troubles.

MR. BLAUW: We like to change our sand at least once a year. Do you use it for this length of time even for your evergreens?

MR. WEDGE: Yes, and we seem to have very little trouble.

MODERATOR FILLMORE: Are there any other questions or does anyone on the panel have anything to offer?

MR. HANS HESS (Wayne, N.J.): I would like to ask Mr. Ferguson at what time of the year he puts his *Taxus* cuttings in under mist.

MR. FERGUSON: They were made the latter part of June, and were rooted by late September and early October.

MR. HESS: Did you leave them outside over winter, and if so with what results?

MR. FERGUSON: Yes, they were overwintered outdoors. The roots were rather tender at the time of transplanting and many snapped. They were put in rows in the field and were banked with straw. There was not over 25 per-cent survival.

MR. HESS: Of those that survived, did they come out of that leached condition satisfactorily?

MR. FERGUSON: Yes. I imagine the leached condition was one reason we had rather poor survival, although they rooted well.

MODERATOR FILLMORE: Mr. Wedge wants to correct an earlier statement he made. Please go ahead, Mr. Wedge.

MR. WEDGE: I was asked whether it was one year or older wood that we used for cuttings. Answering rather quickly, I said new wood. I was thinking of the new growth on the ends, which at times, of course, had older wood at the base.

MR. VAN HOF: Try some cuttings a little bit later and you will probably have better success.

MR. ROLAND DE WILDE (Bridgeton, N.J.): I am interested in this idea of using the sand five years in succession. It has been my personal experience that outside of the sanitation requirements, which I think are best served by changing it practically every crop, there is also the problem that in the course of time you may acquire an inhibiting factor against rooting in sand. I have found that many times, if you have difficulty in getting a certain item to root, take it up and re-start it in a new batch of medium. It will usually bring roots out almost immediately. I would figure changing the sand with every crop would be a paying proposition.

MR. MILTON D. SPANGLER (Hammonton, N.J.): I had an experience this past winter with cuttings of *Taxus*, which turned yellow

and brown and finally died. Most of the cuttings grew and rooted well. I was since told that some of the plants from which I collected my cuttings had stood in water. Whether this caused the yellowing and death of the cuttings, I do not know.

DR. NELSON.: Mr. Hoogendoorn wanted to know if the *Taxus* leached or turned yellow and whether it was persistent.

In practically all instances we had yellowing of *Taxus* under mist, whether in the winter time or in the summer. In 1957 and 1958 we had less trouble with leaching or chlorosis in the greenhouse, since we were shading.

We tried various treatments this year and found that where we supplied short days or shade, we did not get the chlorophyll killing or yellowing. The cuttings were actually greener I think at the end of the season than when they were put in. Now, short days are not necessary in this case, since shade is enough to stop this chlorosis. The yellowing persists only in that portion which is affected and fortunately the new growth that comes out is green again. I have never seen any material where the yellow portion has ever turned green again..

(*Editor's Note:* The membership recessed for a period of ten minutes and then resumed the session.)

MODERATOR FILLMORE: We have heard a discussion this afternoon on the rooting of conifers under intermittent mist. The rooting of conifers by any method is a matter of interest to everyone in this group. Rooting under plastic is one of the newer techniques and to discuss this general subject we have Hugh Steavenson of the Forrest Keeling Nursery, Elsberry, Missouri. Hugh will discuss the "Propagation of *Juniperus* and *Taxus* in a Closed Plastic House" Mr. Steavenson.

Mr. Steavenson presented his prepared paper on the use of the closed plastic house as a propagating facility for evergreen cuttings. (Applause)

PROPAGATING TAXUS AND JUNIPERUS IN A CLOSED PLASTIC HOUSE

HUGH STEAVENSON

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This is a very simple type of propagating structure and procedure, especially suited to folks like ourselves who have a bewildering array of other production and sales problems to worry about.

The system is essentially a cold frame type rooting procedure with provision to permit the rooted cuttings to grow on and develop a full season without disturbance.

Initially, let me say that just about every idea that we have incorporated in this procedure has been borrowed from other members of the Plant Propagators Society. I want to mention Harvey Gray, in particular. A few years ago I took rather vociferous exception to Harvey's poly tent device because of the problems which existed under my par-