Now from Arkansas Mr. H. C. Grigsby has come to tell us about loblolly pine cuttings. Mr. Grigsby!

PROPAGATION OF LOBLOLLY PINE BY CUTTINGS [1/]

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My interest in learning to root the pines came through work in forest tree improvement. We propagate vegetatively to test the heritability of certain features of superior phenotypes. Once selected, trees have proved their ability to pass along desirable traits to their clonally propagated offspring, they are multiplied to obtain material for seed orchards.

Pines are often propagated by grafting, and with considerably more success than by rooting. Grafting, however, has some drawbacks that would make rooting, when perfected, more desirable. Sometimes stock and scion are incompatible. If a tree's superiority is due to its root system, this superiority will be masked when the scion is grafted to the rootstock of an ordinary tree. A reasonably successful technique should make rooting cheaper than grafting.

The following techniques are the ones found most successful with loblolly pine (Pinus taeda L.) after seven years of research involving trials with more than 15,000 cuttings.

The medium of half coarse sand and half perlite was maintained at 78 to 80° F. with heating cables. The greenhouse ambient temperature was kept at 75° F. during the night with hotwater pipes 18 inches below the benches. Daytime temperatures were often higher.

Cuttings from 6 and 25 year old trees were made in mid-November, transported to the greenhouse in dry burlap bags, and placed in the medium the same day. The material was taken from throughout the crowns of the trees, but only the new growth was used.

The growth regulator was an 0.8 percent concentration of indolebutyric acid (IBA) in talc.

Mist was provided with A-6 Humidomist self-cleaning nozzles, which are capable of discharging six quarts of water per hour in continuous operation. The water pressure was 50 p.s.i. Nozzles were placed horizontally in staggered positions on either side of a 5 ft. wide bench. Water lines were set over the walkways in order to keep the drip outside the benches. There was one nozzle for each seven square feet of bench space. The mist system was in operation only during sunlight hours and the mist cycle was 45 seconds per minute. To insure maximum drainage, bench bottoms were made of wire netting covered with a screen. No greenhouse shading was used.

The cuttings were lifted after 19 weeks. Thirty-eight percent of those from 6 year old trees and 47 percent of those from 25 year

old trees produced roots. Of the 293 cuttings, one-third received no IBA treatment; of these, 24 percent from the younger trees and 18 percent from the older trees produced roots.

In another test with 293 cuttings taken in mid-December from 6 year old trees and kept in the medium 25 weeks, 52 percent rooted. An additional 41 percent remained alive at the close of the study. This was the best rooting obtained in the several trials where mist duration, rooting media, IBA strength, and temperatures were varied. In some tests, no rooting was obtained.

Air temperatures from 68 to 75° F. have been tried; rooting was best in the upper part of this range. Temperature of the medium has usually been kept from 3 to 5 degrees higher than greenhouse temperatures.

Peat moss, vermiculite, coarse sand, perlite, and a sand-perlite mixture have been used as rooting media. Peat moss and vermiculite do not appear to provide sufficient drainage where mists are used. Pure perlite does not stimulate root formation as well as a sand-perlite mixture does, but roots that do form are better distributed and tougher.

Cuttings were taken throughout the year; those made from November through January rooted best. Succulent material cut in the spring and summer did not root at all, but the failure may have been due in part to unavoidably high greenhouse temperatures.

IBA has proved to be one of the very best root-inducing hormones for pines. Some rooting has been secured from concentrations of 25 ppm in long soaks to 20,000 ppm in quick dips. At the upper end of this range IBA is too toxic for optimum rooting.

Best results from the quick dips have come with concentrations of 2,000 to 7,500 ppm. Cuttings from younger trees rooted best toward the low end of this scale and cuttings from the older trees rooted best with the higher concentrations. The long soaks have been best with treatments of 100 ppm from 3 to 24 hours. However, 0.8 percent IBA in the powder form has given the best rooting in almost all tests.

In a small informal study last winter, IBA crystals were treated with potassium hydroxide to form a water-soluble salt and hence avoid the need for an alcohol solvent. The results were better than from IBA powder and indicate that further study is warranted.

Various nutrients and metabolites such as sucrose, urea, thiamine, nicotinic acid, and adenine were not beneficial. Adenine appeared to be inhibitory.

The Humidomist A-6 self-cleaning nozzle produced the finest mist, the best coverage, and the least amount of clogging of the various nozzles tried. To keep mist particles small, pressures should be from 50 to 100 p.s.i. One, four and ten-minute cyclers have been tried.

In very dry weather the four and ten-minute cyclers allow desiccation of the foliage. Humidifiers, such as the Defensor units with automatic controls, have not been tested but should be superior to nozzles operated by timers.

An antitranspirant wax applied to the foliage did not lengthen the life of cuttings.

1/ Some of the work described herein was done in cooperation with Professor C.O. Box, Mississippi State University, while the author was employed by the Mississippi Forestry Commission.

MODERATOR O'ROURKE: We will next have Hans Hess, who you all know, and who has spoken before on grafting. He will give us his method of grafting pine. Mr. Hess.

PINES BY GRAFTING

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The Program Chairman very kindly alloted me ten minutes to talk on the grafting of Pines. I believe this is about eight minutes more than is necessary to cover this method of production which is rapidly growing extinct.

A few more years experience with mist propagation and some new additions in the field of root inducers and inhibitors and all of us old grafters are going to be without a trade.

There is only one reason for producing Pine Selections by grafting; up to this time no better or cheaper method has been found. What are some of the Pines reproduced by grafting? All of the selections of White Pine, the fastigiate, the pendulous, the globe and *dwarf form, the various selections of Scotch Pine and also Swiss Stone* Pine. This last Pine can be grown from seed, however, it is a very slow process and the variation in the seedlings is considerable.

The various Pine Selections that are being grafted today are either sports which are quite common among seedlings or the result of witches brooms. For the most part these many types of Pines are not actually new, they have been known for many years but are just now again becoming popular.

The successful grafting of Pines is dependent on several factors. Most important is the selection of a compatible root stock, two needle for two needle varieties, and five needle stocks for five needle scions. Second in importance is a scion which is vigorous and the base wood of which does not exceed two years in age. Older scion wood can be used but the percentage of take generally decreases using this older wood which has less vitality.