

THE VEGETATIVE PROPAGATION OF SOME FOREST TREES

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Woody plants have been vegetatively propagated for more than 2000 years, but not until the past twenty-five years has much attention been given to the vegetative propagation of forest trees, interest in the subject having probably increased with increasing awareness of the possible importance of the clone in forestry (16). Rehder (15) recognized five forms or variants of eastern white pine (*Pinus strobes* L.) but these forms were based upon differences of little interest to foresters.

The writer worked for some years on the vegetative propagation of woody plants in general before he concerned himself especially with the application of these investigations in the improvement of forest trees by the perpetuation of the best. It was at the suggestion of Professors R. P. Holdsworth and A. D. Rhodes of the Department of Forestry of the University of Massachusetts that this work was undertaken, first with white pine and then with other species.

The work of the writer with cuttings of forest trees was done in a greenhouse, sand or mixtures of sand and peat being the rooting medium. Stem cuttings, usually of the most recent year's growth; were obtained from trees about thirty years old. Cuttings of several species of trees are known to root better (in larger percentages) if taken from younger rather than from older trees. It would seem preferable, therefore, to take cuttings as early in the life of a tree, whether a pine or some other genus, as soon as its desirable qualities become evident. This is probably most true of species: the cuttings of which are rooted only with some difficulty.

\*Exact geographic origin is known.

Generally speaking, cuttings of white pine root with more difficulty than cuttings of some other conifers, e.g. Norway spruce (Picea Abies (L.) Karst,) and eastern hemlock (Tsuga canadensis (L.) Carr.),

As with trees in other genera, cuttings from some white pines develop roots more readily than those from other white pines of the same age because the clones differ in ability to root. This past fall and winter, cuttings were obtained from sixteen individual white pine trees which Professor Holdsworth considered to be superior. Cuttings from these trees were taken in November, December, January, and early March. Taken in each of these four months, cuttings from one tree have rooted in larger percentages than cuttings from any of the other trees. Here we may have a clone that is not only superior from the viewpoint of forestry but one which can be propagated vegetatively without too much difficulty. The ability to root may turn out to be almost as important a factor as quality of tree or any other desirable characteristic.

White pine cuttings taken from December to March have rooted in larger percentages than have those taken in October and November, and it now appears that lateral shoots of branches may be less difficult to root than terminal shoots, especially long terminal shoots of such branches. Treatment of cuttings of white pine with a growth substance, a root-inducing substance such as indolebutyric acid, is helpful, often necessary, for rooting,\*

The propagation of a few other pines by cuttings will now be considered briefly, for what is learned about one species may be helpful in handling related ones.

Rooting of cuttings of western yellow pine (Pinus ponderosa Dougl.) by Mirov (12) was improved by treatments applied to cuttings some weeks after their insertion in the rooting medium. It is of interest that in this case, delayed treatments were beneficial, but it is preferable, less work, to treat cuttings before they are inserted in the rooting medium if such treatment gives similar results.

Cuttings of a hybrid pine were found by Duffield and Liddicoet (6) to show great clonal differences in ability to root, and this was true in successive years. Again, it would appear that trees must be selected that can be propagated vegetatively if they are to be so propagated.

There has been, and with good reason, some concern as to whether or not pines and other conifers grown from cuttings will develop into erect and normal trees. Douglas-fir (Pseudotsuga taxifolia (Poir.) Britt.) grown from rooted cuttings by McCulloch (9) had no well-developed leader in the third season. Mirov (11) observed that Monterey pine (Pinus radiata Don) grown from rooted cuttings developed well and normally but he was still uncertain about eastern white pine and western yellow pine five years after cuttings were rooted. However, and here is evidence that such adjustment may take a little time, Deuber (2) noted that the new shoot on some rooted cuttings of Norway spruce did not develop normally at first, but new growth approached normalcy in the second year and was vertical and normal in the third year, indicating that the plagiotropic habit of growth may be only temporary.

When mention is made of treatments or of treated cuttings in this paper, the reference is to the use of root-inducing substances.









