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ROOTING OF DOUGLAS FIR CUTTINGS BY A PAIRED-CUTTING TECHNIQUE

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A study of rooting of Douglas fir cuttings was undertaken two years ago because vegetative propagation of Douglas fir by grafting had not been entirely satisfactory. In recent years much overgrowth of rootstock by the scion has become apparent resulting in poor growth and eventual death of the tree. A barrier to translocation of assimilate from the plant top to the root seems to develop at the graft union and leads to starvation of the rootstock.

Chemical treatments have not been consistently successful in rooting Douglas fir cuttings from mature trees. Other workers have found, as we have, that indolebutyric acid (IBA) will induce rooting in cuttings from old trees but the results can not consistently be replicated in other years and with other trees. Mechanical aids, such as wounding, have not improved the results. On the other hand, cuttings from seedlings of Douglas fir root fairly readily even without chemical treatments. It, therefore, seemed worth testing whether cuttings from old trees could be induced to root by grafting cuttings from young trees onto them.

At the end of March, 1966, 60 cuttings from mature trees (80-100 years old) and 60 cuttings from 5-year-old Douglas fir seedlings were grafted together in pairs. Hereafter, for convenience, these are referred to as "old" and "young" cuttings, respectively. Only the last annual shoots were used and they were cut to a length of about 3 inches. The cuttings were side-grafted for a length of about 1 inch at the base of the stem and held together by elastic bands. The basal ends were cut flush after grafting. This is referred to as butt grafting. The paired cuttings were set with the base in 50 ppm IBA for 24 hours and thereafter placed in a rooting bench with perlite and kept under intermittent misting. The graft union was completely buried in the rooting medium. After 17 days in the bench the union between the paired cuttings was sufficiently strong to permit removal of the elastic bands. Since the basal growth of the cuttings is considerable, the bands are removed as soon as possible to avoid constriction.

During the first 2 months in the bench 17 pairs rooted; after 3½ months 28 pairs had roots and 54 pairs had roots

after 6 months. Out of the 54 pairs with roots, 50 had roots on the young cutting, 20 had roots on both the young and the old and 4 had roots on the old ones only. This gives a rooting percentage of 40 for the old cuttings and 83 for the young. Cuttings from old trees did not root better than 30% when set alone and such a high percentage was an exception. It would, therefore, appear that the young cutting had a stimulating effect on rooting of the old cutting.

To test this further, more experiments with paired cuttings were performed in the spring of 1967. Three different types of grafts were tried. One type was the butt graft used the previous year having the basal ends of the paired cuttings cut flush. In another the young cutting was side-grafted to the old cutting leaving ¼ inch of the old cutting below the union. In a third type, the old cutting was grafted to the young leaving ¼ inch of the base of the young cutting below the union. All paired cuttings and the individual control cuttings were treated with a 24-hour soak of the basal end in 100 ppm IBA. One-half the cuttings were set in sand and the other half in an equal mixture of sand, perlite and peat moss. The success of rooting for the different types of grafts could depend on whether the presence of an inhibitor, or the lack of a rooting promoter, was responsible for poor rooting in the old cuttings since the rooting regulator might concentrate in the end of the cutting forming the base.

The results with paired cuttings have not been as good this year as in 1966. It may still be too early (mid-August) to predict the final outcome but to date only 10% of the old cuttings have rooted when grafted to young cuttings (type 3 above) and only one out of 50 have rooted when the old cutting formed the base of the pair (type 2 above). The latter result was also obtained with the butt-grafted pair. The rest of the paired cuttings look healthy and it is hoped that more will root. None of the single cuttings from old trees have rooted, so pairing with young cuttings seems to have had some beneficial effect. Cuttings from young trees have also rooted poorly this year with a percentage of 28 to date while a percentage of over 80 rooted last year. This may explain why the paired cuttings have not given better result although the cause of the generally poor rooting this year is not known. Cuttings collected in March have rooted better than those collected in February or in April. The rooting mixture has been superior to pure sand.

Results obtained with paired cuttings of Douglas fir are promising enough to warrant further study of this approach to rooting of cuttings from mature trees. The technique could be of value as a research tool and also for large- scale rooting until chemical treatment of single cuttings becomes more successful. Furthermore, there is the possibility that the roots formed on the young cutting in the grafted pair will adequately support the old cutting without the difficulty of

overgrowth encountered with Douglas fir when the conventional type of grafting is used.

MODERATOR BRIGGS: We will now open the session for questions. Who has the first one?

BILL CURTIS: Don Dillon, what was the proportion of PCNB and Captan in your fungicidal cutting dip?

DON DILLON: One-half cup PCNB and 2½ cups Captan (40% wettable) in about 20 gallons of water.

RALPH PINKUS: In dipping your cuttings, you said you use 1 gram of IBA crystals and 99 grams of talc. What other ingredients were in the mix?

DON DILLON: Fermate, 25 grams.

VOICE: Dr. Brix, what was the rooting medium you used in your tests with Douglas fir?

DR. BRIX: Either pure sand, or ⅓ each of sand, peat moss, and perlite.

JOE WHEAT: Working with Douglas fir, I have found that using very much peat moss in the mix will kill the young tissue.

DR. BRIX: We have found the same thing with Douglas fir; half sand and half peat moss is too much peat.

BRUCE BRIGGS: We tried using just a piece of stem, without leaves, for the understock on unrooted rhododendron grafts but came up with a blank.

DON DILLON: I might suggest you try keeping leaves on the understock. We found in citrus that this is the key to the whole thing. It requires full-sized leaves — we don't cut our leaves back at all — and we have to have the leaves on both pieces to really do the job. If leaves are present on the rhododendron understocks, you might find that there is enough stimulus from them to get rooting.

HOWARD BROWN: A question for Rudy; do you cut your conifer understocks back completely in 6 weeks?

RUDY WAGNER: The understocks are cut back as soon as they come out of the rooting bench — just before potting.

WALTER VAN VLOTEN: A question for Don. You say you use IBA, talc and fermate. Why do you use talc? Why don't you use just IBA and fermate?

DON DILLON: The talc is just a filler. We buy IBA crystals from Eastman Kodak Co. and have them ground into a powder by our local druggist and he mixes it with talc, but it's just a filler.

WALTER VAN VLOTEN: We do the same, except we only use Captan powder plus IBA crystals.