NOTES

PROPAGATING *NOTHOFAGUS SOLANDRI* VAR. *CLIFFORTIOIDES* VEGETATIVELY

P. W. CATH*

SYNOPSIS

This paper records attempts made to propagate Nothofagus solandri *(mountain beech) vegetatively. Varying success was achieved in establishing roots. Cuttings taken in October, treated with Seradix 2 or 3 and planted in a mixture of sand and peat were the most successful. Hardening-off was the most difficult part of the process and casualties were high.*

INTRODUCTION

Not much is known about the vegetative propagation of *Nothofagus solandri* (mountain beech). Experiments were undertaken in the nursery at the Forest and Range Experiment Station, Rangiora, to test various techniques.

LITERATURE REVIEW

The practice of propagating forest trees vegetatively has increased considerably during the last two decades. In trials where a uniform batch of plants is required, the method of propagation by cuttings is inexpensive, rapid and simple. There is no special skill required as for grafting or budding, and there is not the problem of compatibility with rootstocks (Hartmann and Kester, 1959).

There is, however, a danger when selecting cutting material from "mother trees", that inferior cuttings are collected. Garner (1944), Achterberg (1959), Matthews *et al.* (1960) and Herrmann (1961), stress the importance of the age of the "mother tree" and also the position the cutting had on the "mother tree". Garner and in some degree the other authors agree that younger plants generally supply better cutting material than older plants or trees. The "mother tree" should also be healthy and, wherever possible, fertilized beforehand (Enright, 1959). Chandler (1959) found that larch cuttings rooted better when taken from two- to four-year-old trees, and least when stock was 27 to 30 years old. He also recommended the use of "tip" cuttings from terminal shoots. They usually root better than the basal portions.

When difficult-to-root cuttings are involved it is often considered a good practice to take the cuttings with a "heel" (piece of old wood from the main branch). Garner (1944), Wells (1955) and Hartmann and Kester (1959) discuss the advantages of cuttings taken with a heel. In theory more food

*Technician, Forest Research Institute, Rangiora.

reserves are found in this piece of old wood which could facilitate the formation of roots. To determine the optimum time to take *Nothofagus* cuttings was part of this study. Elk (1965), in his studies on *Chamaecyparis* and *Juniperus*, took his cuttings at fortnightly intervals. Monthly intervals for this trial were considered sufficient.

Care was taken when the cuttings were collected that the weather was fine. Kruyt (1943) found that with most conifers it was detrimental to collect cutting material during rain and overcast weather, which ties in with the findings of Rowe-Dutton (1959). During rain or dull weather, lack of sunlight impedes photosynthesis, food reserves are not accumulated, and therefore rooting potential is decreased. The question of what sort of medium to use for any sort of cutting is a complicated one. Challenger (1961) used fresh sawdust mixed with sand (1:1) to replace peat, which is rather scarce in New Zealand. Results were slightly inferior. In general, the medium should be a free-draining one when used under mist. In this trial peat was used, but probably vermiculite or perlite could have minimized to a certain extent some of the rotting that occurred in the sand-peat mix. Cummins (1960) points out that fungi thrive at the lower pH of an acid medium like peat. Some other authors—Ealy (1960), van Elk (1964) and Snyder (1966)—advocate hormone-fungicide combinations to avoid fungi problems.

From preliminary trials it became clear that the hardening-off process was the most critical part of the propagation. Cuttings reared under mist should be weaned very slowly. Challenger (1968) found at Lincoln College that hardening-off before transplanting (potting) gave better results than first potting and then hardening-off. He had 100% survival with *Ceanothus thyrsiflorus* when hardened-off first, and only 69% when hardening-off was done after transplanting.

METHODS AND MATERIALS

All experiments took place in a small glasshouse with a propagating unit (bottom heat and mist facilities). The trial commenced early spring 1967 and was repeated in spring 1968. The type of cuttings used were lateral "tip" cuttings taken from trees not older than 12 years. Cutting material was taken from the top (apex) of the trees. All the material came from five trees situated near the Lyndon Hut (State Forest No. 22), Craigieburn Forest Park, at an altitude of 800 m.

The size of the cuttings was kept fairly small (3 to 5 cm) and the cuttings which were taken with a "heel" were slightly wounded, using a scalpel, before being moistened and dipped in a hormone powder. Any surplus powder was flicked off. To produce cuttings with a "heel" one simply pulls the cutting carefully from the main branch. A slice of the older wood is then attached to the cutting. This should be trimmed up and it is important to maintain a clear cut surface at the base of the cutting. A dibbler is used to plant the cutting in the different media, to prevent the hormone powder being removed.

The media in which the cuttings were inserted consisted of these three mixtures:

(1) A mixture of washed sand (plaster sand) and sphagnum moss (1 : 1).

(2) A mixture of washed sand and peat (ex Hanmer Forest) (1 : 1).

(3) Washed sand only (control).

One hundred cuttings were collected at three different dates —15 September, 15 October and 15 November—for each treatment. There was only one day between collecting and inserting the cuttings.

Two types of Seradix were used: No. 2, which is recommended for semi-hardwood, and No. 3, which is used for hardwoods. As a neutral powder, which in some cases gives good results, ordinary talcum powder was used, while 100 cuttings were left untreated as a control. Examination of callusing and root formation was done very carefully once a month.

The size of the boxes in which the cuttings were inserted was 20 × 35.5 cm and 9 cm deep. After an initial watering the boxes were placed in the propagation unit with a fairly low bottom temperature (10.0 to 15.5° C) and kept moist by mist-spray (electronic leaf).

No whitewash was applied to the glasshouse but on hot days top ventilators and ventilators below the benches were used.

RESULTS

Success in establishing roots was variable. In some cases where good roots were formed, the cuttings suffered during the hardening-off period, and also during the potting-up process.

Cuttings in mixture No. 3 (sand only) showed some callus about four weeks after insertion, but this mixture did not seem to induce many roots to form; instead, callus knobs developed. They were cut off to see whether this would induce rooting, but only in a small number did their removal result in root formation. In mixture No. 2 (sand-peat) callus growth was different and not so abundant as in mixture No. 3. However, more roots were formed. The drawback here was that some rotting occurred on the tips of the young roots. In future trials a combination of hormones and fungicides (benlate or thiram) would probably be beneficial. The first roots in mixture No. 2 were noticed approximately seven weeks after insertion of the cuttings.

The examination of roots in mixture No. 1 (sand-sphagnum moss) was rather difficult as roots were well entangled with the moss. The formation of callus in this mixture was slower; six weeks elapsed before any form of callus was noticed, but root formation must have commenced soon thereafter, or even at the same time. On several cuttings roots appeared without the usual callus formations. Rotting in this mixture was very

TABLE 1: ROOTING PERCENTAGES RELATED TO TREATMENTS

Mixture and Treatment	*Dates of Collection*		
	15 Sep.	*15 Oct.*	*15 Nov.*
1. Sand and sphagnum moss:			
Seradix No. 2	18	22	13
Talcum	16	21	13
Seradix No. 3	19	20	14
Control	15	18	10
2. Sand and peat:			
Seradix No. 2	33	40	24
Talcum	28	36	20
Seradix No. 3	32	38	21
Control	28	30	16
3. Sand:			
Seradix No. 2	8	12	6
Talcum	6	8	3
Seradix No. 3	8	10	4
Control	4	6	0

rare. Rooting percentages, however, were lower than those for the sand-peat mixture.

Rooting percentages for the three mixtures are shown in Table 1.

DISCUSSION

From the figures in Table 1, it is obvious that pure sand was the least successful medium. The sand-peat mixture showed the highest percentages of roots. Not much difference was found between the two strengths of Seradix; No. 2 showed slightly better results than No. 3. Ordinary talcum powder gave lower figures than any of the Seradix powders but in most cases it gave better results than the controls. When the different collection times are compared, it is evident that October cuttings gave best results.

Hardening-off the rooted cuttings started when these cuttings were three months old. Although every precaution was taken, casualties were high and most cuttings were scorched and died during one extremely hot weekend. The high light intensity required during root formation proved fatal during hardening-off. More shade is then required to make up for lack of mist.

Reviewing the results up to the hardening-off stage, it appears that a sand-peat mixture in combination with Seradix No. 2 or No. 3, and collection of cuttings in October, gave the best results.

REFERENCES

Achterberg, H. H., 1959. Zur vegetativen Triebvermehrung Forstgeholze. *Forst u. Jagd., 9* (2).

Chandler, C., 1959. *Contr. Boyce Inst.,* 20/3.

Challenger, S., 1961. New Zealand discovers fresh uses for sawdust. *Grower*, London.

———, 1968. *Lincoln College Annual Report.*

Cummins, J. N., 1960. Vermiculite and perlite. *Am. Nurseryman*, Cornell University, Ithaca, N.Y.

Ealy, R. P., 1960. The effect of a combined fungicide and hormone treatment on the propagation of redcedar (*Juniperus virginiana*) by cuttings. *Processed Series*, Oklahoma State University.

Elk, B. G. M. van, 1964. Proeven met winterstek. *Extr. Jaarboek Proefsta. Boomkwek.* Boskoop.

———, 1965. A study of the optimum time for taking conifer cuttings. *Extr. Jaarboek Proefsta. Boomkwek.* Boskoop.

Enright, L. J., 1959. Growth response of rooted cuttings of pine and spruce. *J. For., 57* (7): 509-10.

Garner, R. J., 1944. Propagation by cuttings and layers. *Tech. Comm. 14, Bureau Hort. Plant Crops*, East Malling.

Hartmann, H. T.; Kester, D. E., 1959. *Plant Propagation Principles and Practices.* Prentice-Hall, N.J.

Herrmann, S., 1961. Wachstumsuntersuchungen an vegetav vermehren Baumen sowie uber ein Verfahren zur Gewinnung schnell wuchsiger Forstpflanzen. *Allgemeine Forst und Jagd., 8.*

Kruyt, 1943. Groeven met groeistoffen by het. *Extr. Jaarboek Proefsta. Boomkwek.* Boskoop.

Matthews, J. D.; Walker, A. J.; Potts, K. R., 1960. Propagation of Leyland cypress from cuttings. *Quart. J. For., 54* (2).

Rowe-Dutton, P., 1959. *Mist Propagation of Cuttings.* Comm. Agric. Bureaux.

Snyder, W. E., 1966. *Hormone-Fungicide Combination in Rooting.* Proc. Plant Propag. Soc. (E. Region), Newport, N.I.

Wells, T. S., 1955. *Plant Propagation Practice.* MacMillan, N.Y.