PRACTICAL ASPECTS OF ROOTING AND GROWTH OF RIMU CUTTINGS

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The Rimu *(Dacrydium cupressinum)* is one member of a predominantly South Pacific genus in the family Podocarpaceae. There appear to be about 20 species in the genus (1), occurring in Malaysia, Borneo, New Caledonia, New Guinea, Philippines, Tasmania, Chile and New Zealand. In N. Z. there are 7 endemic species, (1) ranging from the Rimu which attains heights up to 35 metres and rarely to 60 m, down to the Pigmy pine, *D. laxifolium*, often only 0.5 to 1 metre high. In terms of size the Rimu would rank as the largest tree in the genus with its closest rival the Huon pine of Tasmania, *D. franklinii*, which attains a height of 30 metres.

Rimu has always been an important timber species in N. Z. and the volume cut annually at present amounts to 15 to 20% of the total timber production. For over 70 years the country has enjoyed almost unlimited supplies of this versatile wood, but the trend over recent years has been towards decreasing the cut, to conserve a dwindling resource. Rimu is the most widely distributed of all our native tree species and is prominent in many forest types from North Cape to Stewart Island. It occurs naturally over a wide range of climatic conditions, on widely differing soils, and has an altitudinal range from sea level to 950 m. (3). Because of this wide adaptation to differing sites the species would appear eminently suited to artificial establishment on a forestry scale. As yet there are no artificially established stands in existence (4), although small scale plantings have been done to supplement natural regeneration.

At Hunua nursery, production of Rimu is for this latter purpose and enrichment plantings are undertaken in areas where the natural stocking of seedlings is at a low level. Our annual programme calls for ca. 5000 to be set out and the usual methods of propagation in the past have been to collect small "wildling" plants from the forest floor, and to sow seed directly, when this is available. Nursery production depends then upon a good source of seed, but unfortunately Rimu is a shy seeder, and a good seed year may occur only once or twice in ten years (4). This variation in seed; and (consequently) seedling availability has led to our recent trials with cuttings, as an alternative means of propagation.

Rimu is one of the most graceful and beautiful of N. Z. native trees and apart from its place in forestry establishment it has un-

questioned horticultural merit. Young trees especially, have pale green drooping foliage, this taking on bronzy hues in winter; indeed, a splendid specimen tree.

The species is mainly dioecious, and there is a noticeable difference in appearance of male and female trees. Franklin (3) describes the differing characteristics: "in female trees the ends of fertile branches are upturned, giving the foliage a tufted appearance when viewed from the side, while in male and juvenile trees, the branchlets remain pendulous." It does not appear possible to separate young nursery plants by these characters although some individuals do exhibit a very pronounced "weeping" habit at early stages of development.

Such variation in the foliage and form of individuals should lead to cultivars being produced asexually for garden planting. Likewise in forestry, selection of individuals can be made to improve the performance of planting stock.

PROPAGATION METHODS

Past Work. Early trials at Hunua (2) and at Massey University (6) have shown that Rimu can be propagated successfully by cuttings from juvenile stock plants. At Hunua, terminal cuttings were used, set in a scoria/peat mixture and rooted under mist with no bottom heat. At Massey, cuttings were set in a pumice/peat mixture and rooted with bottom heat in a glasshouse with light watering.

In both these trials the application of indolebutyric acid in talc improved speed of rooting and number of roots formed. In Hunua trials 0.8% IBA (Seradix 3) gave best results, while at Massey 2.0% IBA was reported to give an even better result than the 0.8% level.

Wounding of the cutting base gave somewhat varied results in our Hunua trials, but proved to be beneficial at Massey. In both these trials, cuttings made good height growth after potting. Little information is available on cutting performance from older trees. Richards (6) set cuttings from an "adult" tree and observed that rooting and growth after potting was slower than for juvenile plants.

A current trial at Hunua with cuttings from an 18-year-old tree (garden planted) indicates that cuttings root more slowly, produce fewer roots, and grow at much slower rates than juveniles; this is the case (at least) in the initial development stage.

At this stage cuttings from young stock plants offer the best potential in propagation, they root easily, have 80-100% take, and grow well after potting.

Time of Year for Setting. In a series of trials we have set cuttings every month of the year except February and May, and even though percentage rooted varies, cuttings have always formed adequate root systems despite the month of setting. However, cuttings set in late autumn (April) and through the winter do not usually form roots until the following spring (September).

A current trial in which terminal and lateral cuttings were set monthly from June to December indicates that September-set cuttings gave good overall results in terms of speed of rooting, percent rooted, and height increment after potting.

In an earlier trial March-set cuttings also gave extremely good results, and this offers a choice of setting time dependent upon what size plant is required for planting to the field. At this stage we favour March for setting terminal cuttings as (in trials) they grow faster, enabling us to put out a 30 to 40 cm plant in May/June, 15 to 16 months from setting. With lateral cuttings these grow more slowly and a September setting would give us a 30 to 50 cm plant in 20 to 21 months.

We have not been able to demonstrate conclusively in our trials (to date) that any one month is optimum for setting; rather, the time to set will depend upon end use, size of plant required, the nursery production system, and facilities available.

Stock Plants and Cutting Material. Stock plants are 2 to 4 years of age grown under about 60% shade; they are not specially selected (at present) and are drawn from ordinary nursery stock.

Terminal cuttings are made by severing just above a strong growing semi-upright lateral; cuttings are made 10 to 15 cm long, with basal leaves removed (this is a form of wounding) and 0.8% IBA (Seradix 3) applied.

Lateral cuttings are taken by selecting semi-upright material from near the apex of the stock plant; 4 to 6 cuttings can usually be gathered from this source. Recent trials (not yet concluded) indicate that lateral cuttings from the apex of the stock plant (if tending upright) form a normal orthotropic shoot. It was suggested (2) that cuttings taken from lateral branches would continue to grow horizontally, and this may still occur if material is selected from pendulous branchlets, but does not appear to be the case with upright laterals.

The effect on the stock plant when a terminal shoot is removed is for the lateral to assume the terminal role (in most cases) Figure 1.

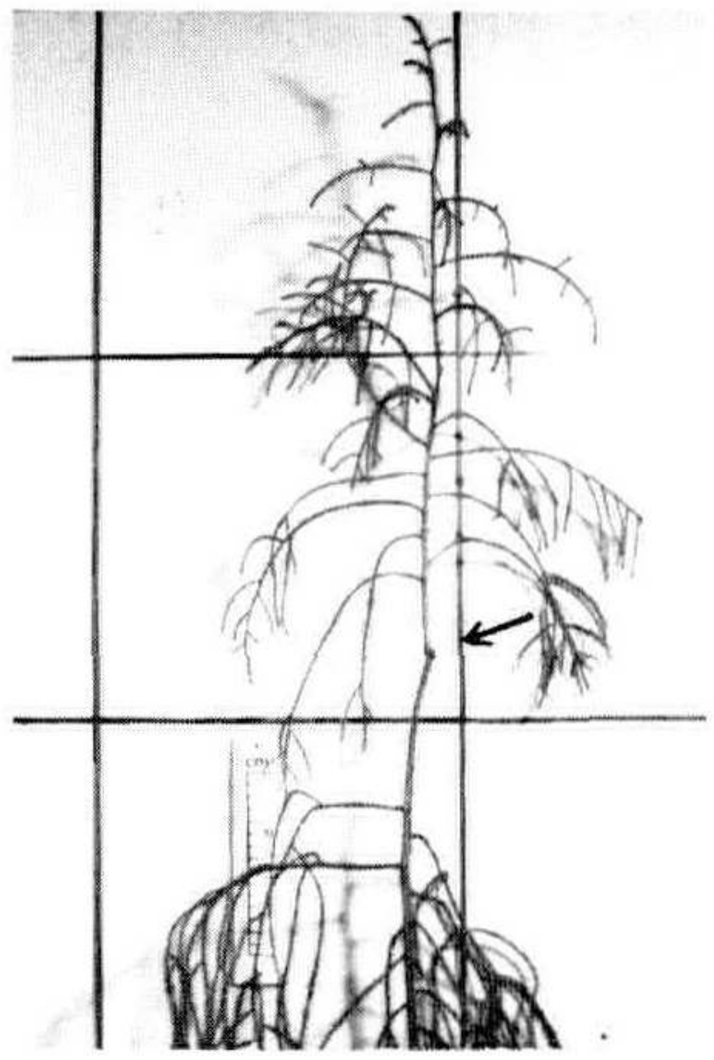

Figure 1. This shows the point where the terminal cutting was taken and shows regrowth of lateral. (Note increasing weeping habit from apex to base.)

The time taken for the lateral to come upright seems to depend upon the length of season left for growth; i.e. in our trials 85% of laterals on stock plants used in Sept-Oct came upright by April, some 7½ months after cuttings were taken, whereas with December stock plants only 26% of laterals were upright by the same date (5 months later).

We attempted to shorten the time taken for laterals to come upright by tying them to a stub left on the main stem; results revealed that this had little effect when compared with control plants. There is a marked variation in the ability of laterals to form a vertical shoot; those with semi-fastigiate branchlets coming upright sooner, and with less stem deformity.

Growing Conditions. The setting mixture consists of scoria, sand and peat (2), but we have reduced the size range of scoria used previously to 0.25 - 4.00 mm particle range and cut down on sand content by 50%. The mixture is scoria, sand, peat — 3:½:½ parts by volume and has enabled the cutting to be held more firmly in the container. Cuttings are placed in individual plastic tubes (4 cm diam.); these are more satisfactory for later handling than trays and have given good results in rooting.

Cuttings are struck under intermittent mist and first roots are formed (with September settings) in 7 to 8 weeks. In a previous experiment (2), November and January set cuttings formed first roots in 6 to 7 weeks, while June settings (2, 6) produced first roots in about 12 weeks. The effect of temperature is evident here and as conditions become warmer the time taken for cuttings to form roots was shortened.

It was speculated that bottom heat might be of benefit in start-

ing cuttings earlier in the season (2) and a recent experiment has shown this to be the case. A batch of cuttings taken in late April were placed in a cold frame. During mid-August 100 were relocated on a bench with bottom heat maintained at 20 to 23°C and a control lot was placed alongside as comparison on an unheated bench. After 5 weeks cuttings were examined and those with basal heat had 90% rooted compared with no heat, 20% rooting.

Growing on. Cuttings are removed from the mist when roots are about 20 mm long, and potted into plastic pots (5½ x 9½ cm). The potting medium is fine sand and peat (50/50), with base fertilizer added. Variation in length of time to form roots is experienced between individuals and it is not considered worthwhile retaining late rooting cuttings after 70 to 80% of a batch have rooted (2). Plants are grown on under shade before final potting in a small planter bag. After a further period in the shadehouse they are moved outside to harden off before winter planting.

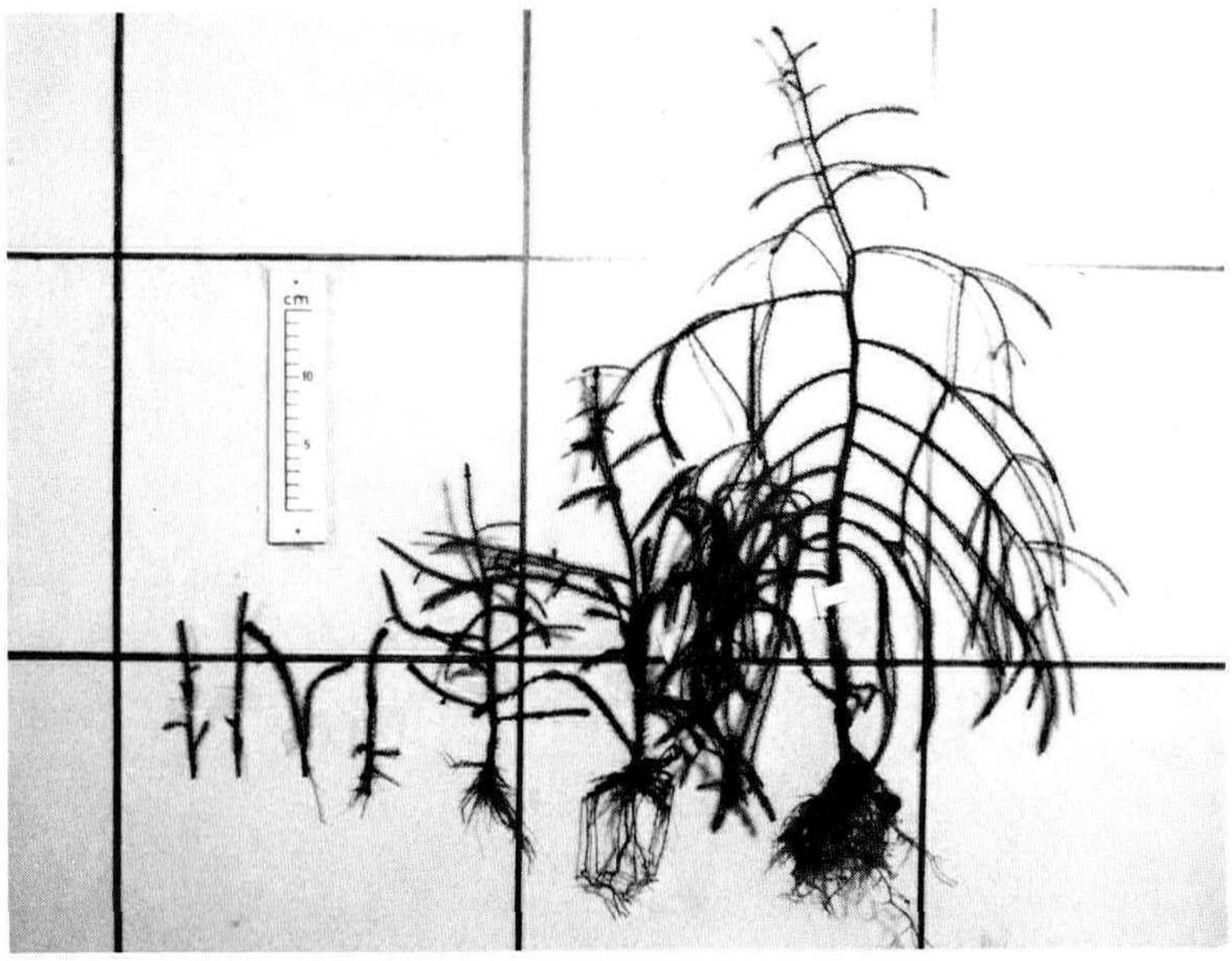

Figure 2. Development of cuttings from setting to plantable size.

CONCLUSION

Rimu *(Dacrydium cupressinum)* is an easy species to propagate with cuttings from juvenile nursery plants. Cuttings do not necessarily require elaborate facilities and, although aids such as misting are of practical benefit, will root quite successfully in a simple cold frame. (unpub. notes)

The species responds well to applications of a root promoting

chemical (IBA) which hastens root initiation and increases number of roots formed. Recent trials have also shown that heat at the cutting base is beneficial in starting root formation earlier in the season (in early spring).

The effects of tree age on the rooting and growth of cuttings is an area in which further research is needed and, in common with many other tree species, Rimu cuttings appear to respond and grow more slowly as trees become older. This is of some importance because if plants are to be chosen for some "superior" characteristic, i.e. vigour, special foliage form, or colour, etc., then this will often not be identifiable until an adult stage of growth is reached. To ascertain the phase of growth (or age) at which Rimu cuttings lose vigour (past an acceptable limit for propagation), will require setting a series of cuttings from trees of various ages.

Some of these maturation effects may be arrested by repeatedly pruning back all new growth above a certain height as has been done in trials with *Pinus radiata* (5). "Over the 7 to 8 years of the studies, the training of trees as hedges arrested the normal decline in rooting percentage, quality of roots, and growth potential of cuttings taken from ageing tree-form plants" (5).

Such "hedging" may also provide a partial solution to building up nursery stocks. Training plants as hedges should yield a good quantity of upright cuttings. Radiata pine (5) hedges yield over 100 cuttings per square metre of hedge top per year. A particularly bushy Rimu at Hunua (9 years old), although not trained as a hedge, yielded 150 upright cuttings from sides and apex.

However, it is unlikely that plants will be specially set out and trained as hedges until quality clones have been identified. In the interim, most cuttings will come from young plants in the nursery bed; these should be carefully evaluated for form and vigour before using to provide cutting material.

ACKNOWLEDGEMENTS

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QUESTIONS

Q. What is the fertilizer composition when the plants are moved from the liner stage to containers?

A. 2.4 kg Osmocote, 0.3 kg Uramite, 1.0 kg superphosphate, 2.4 kg dolomite lime, 1.0 kg calcium carbonate, per cubic meter.

Q. Does the bronzing colour of Rimu have any effect on the rooting of cuttings?

A. At this stage there are no obvious indications that colour of wood selected gives better rooting results.