# VEGETATIVE PROPAGATION OF *EUCALYPTUS GRANDIS*

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ABSTRACT

Grafting of **Eucalyptus grandis** has not been successful in northern New South Wales because of delayed incompatibility. Attempts to root cuttings from seedlings and coppice shoots from the bases of older trees have been moderately successful.

## INTRODUCTION

Flooded gum (*Eucalyptus grandis* (Hill) Maiden) is one of the most important plantation eucalypts on the coastal area of northern New South Wales. A tree improvement programme was begun two years ago with the selection of a number of desirable phenotypes from the older plantations. Vegetative propagation of the selected trees was considered important, not only to produce a clonal seed orchard, but also to allow easy access to flowering material for cross-pollinating purposes.

## GRAFTS

Scion material from 20 selected trees was collected in late spring and grafted by the bottle technique (*see* Pryor and Willing, 1963) onto random *E. grandis* nursery stock. Ten grafts were made of each tree, and these were kept in an unheated glasshouse with 5-minutes mist every half hour during the day for approximately 4 weeks. Take was excellent with an average of 80% over all clones. The grafts were planted in the field in midsummer and made rapid initial growth. By the following spring 57% of all grafts planted were showing signs of incompatibility, with overgrowth of the stock by the scion. By the end of the summer, only one graft was growing actively with no obvious signs of incompatibility; of the remaining grafts approximately 60% were dead.

The single actively growing graft produced a flower crop in late summer and was used as the female parent in a number of artificial crosses. By the following spring, however, this graft also was dead and had, in fact, blown over with a clean break at the point of union. All the remaining grafts showing overgrowth symptoms had by this time also died.

This result was unexpected considering that Pryor and Willing (1963), using a wide range of eucalypt grafts, had not encountered large-scale incompatibility. These workers did not, however, graft *Eucalyptus grandis.*

## CUTTINGS

A preliminary trial of 100 cuttings from 10 seedlings of *E. grandis* used vermiculite as a potting medium, with a basal powder dip of 3000 ppm of indolebutyric acid. The cuttings, which were taken in spring, were kept in a glasshouse, with bottom heat and overhead mist supplied for 15 seconds every 5 minutes. Rooting took place over a period of 3 to 4 weeks. Fifty-seven rooted cuttings from eight of the seedlings were planted into the field and have grown, though not very rapidly, for 18 months.

A further trial to make a preliminary examination of the variation between the rooting ability of individual seedlings and between provenances of *E. grandis,* as well as the possibility of hedging the seedlings, was begun late in winter 1972. Four or five seedlings from each of nine provenances were potted into 4.5-litre pots and kept in a glasshouse. Seedlings were cropped for segments of cutting material when they had reached a height of 10-12 nodes. As a result of different individual growth rates the number of cuttings obtained over a 6-month period varied considerably between seedlings. In two instances seedlings died as a result of cutting back. Cuttings were rooted under the same conditions as described earlier. Table 1 shows the results over the 6-month period.

Those cuttings which callused but did not produce roots were considered, from the practical point of view, to have failed. Out of a total of 777 cuttings set 42% produced roots, 46% callus but no roots, and 12% died.

The figures in Table 1 lend support to the idea that there is considerable variation between the ability of individual seedlings to produce roots under the test conditions. For example, Queenslake 2 and Pine Creek 5 seedlings did not produce any roots at all. All cuttings of Queenslake 2 died, while 14 out of 18 cuttings of Pine Creek 5 produced callus but no roots. Cuttings of the seedlings from Pine Creek 3, Orara East 4, and Nulla Five Day 1 and 4 rooted readily. Pine Creek 1 is somewhat anomalous as only two cuttings were obtained.

On a provenance basis there also appears to be an overall difference but this may be a fortuitous result of the limited sampling and wide variation within a provenance.

There are indications that rooting was best in mid- and late-summer:

| Date Set | Number | % Rooted |
|---|---|---|
| 29. 8.72 | 43 | 16 |
| 1. 9.72 | 19 | 11 |
| 15. 9.72 | 76 | 24 |
| 24. 9.72 | 53 | 42 |
| 8.11.72 | 66 | 61 |
| 22.11.72 | 116 | 16 |
| 29.11.72 | 71 | 51 |
| 1.12.72 | 42 | 26 |
| 5.12.72 | 17 | 59 |
| 20.12.72 | 51 | 73 |
| 3. 1.73 | 12 | 50 |
| 2. 2.73 | 33 | 68 |
| 20. 2.73 | 178 | 53 |

TABLE 1—Number of cuttings rooted by individual seedling and provenance

| Provenance & Latitude | Seedling Number | Total Cuttings Set 29.8.72 to 2.2.73 | Number Rooted | Cuttings, Total of Provenance | Provenance % Rooted |
|---|---|---|---|---|---|
| Queenslake | 1 | 17 | 4 | | |
| 31° 35'S | 2 | 11 | 0 | | |
| | 3* | 3 | 2 | | |
| | 4 | 24 | 6 | | |
| | 5 | 6 | 2 | 61 | 23 |
| Nulla Five Day | 1 | 25 | 18 | | |
| 30° 43' | 2 | 39 | 22 | | |
| | 3 | 20 | 11 | | |
| | 4 | 21 | 16 | 105 | 64 |
| Bellinger River | 1 | 24 | 8 | | |
| 30° 27' | 2 | 29 | 15 | | |
| | 3 | 25 | 6 | | |
| | 4 | 12 | 3 | 90 | 36 |
| Pine Creek | 1* | 2 | 2 | | |
| 30° 24' | 2 | 9 | 2 | | |
| | 3 | 13 | 12 | | |
| | 4 | 20 | 3 | | |
| | 5 | 18 | 0 | 62 | 31 |
| Tuckers Knob | 1 | 23 | 12 | | |
| 30° 22' | 2 | 22 | 2 | | |
| | 3 | 24 | 3 | | |
| | 4 | 26 | 10 | 95 | 28 |
| Cascade | 1 | 32 | 11 | | |
| 30° 14' | 2 | 25 | 14 | | |
| | 3 | 27 | 13 | | |
| | 4 | 11 | 4 | | |
| | 5 | 23 | 11 | 118 | 45 |
| Orara East | 1 | 31 | 12 | | |
| 30° 13' | 2 | 15 | 10 | | |
| | 3 | 24 | 12 | | |
| | 4 | 19 | 15 | | |
| | 5 | 25 | 15 | 114 | 56 |
| Cherry Tree | 1 | 10 | 7 | | |
| 28° 53' | 2 | 26 | 7 | | |
| | 3 | 17 | 4 | | |
| | 4 | 13 | 3 | 66 | 32 |
| Mebbin | 1 | 18 | 12 | | |
| 28° 26' | 2 | 18 | 8 | | |
| | 3 | 15 | 5 | | |
| | 4 | 15 | 5 | 66 | 45 |

* Seedling died.

*E. grandis* when cut down during normal logging operations will occasionally produce stump coppice shoots. Eighty-three shoots were collected from the stump of a 40-year-old tree at a height of approximately 30 cm above ground level. These shoots were given the standard cutting treatment and after 6 weeks forty-seven had produced roots.

In another experiment, three trees on a 7-year-old plantation were semi-girdled at a height of 30 cm and, on the opposite side of the tree, 60 cm above ground. Coppice shoots produced from the basal 30 cm of stem were collected and set as cuttings, being given the standard treatment as previously.

| Tree | Number of coppice cuttings | % rooted |
|---|---|---|
| 1 | 14 | 43 |
| 2 | 18 | 56 |
| 3 | 23 | 52 |

## DISCUSSION

The complete failure of the grafted *E. grandis* is surprising and could well result in the complete adoption of the seedling seed-orchard approach to the tree improvement programme for the species. In fact, this practice has been adopted on an interim basis; it will be expanded to include all the 150 trees selected so far. However, because of the advantages of clonal reproduction, further work will be done using related seedlings and closely related species, such as *E. saligna* Sm., as understocks.

One of the major uses of *E. grandis* will be for pulp, and as this is a very fast-growing species, rotations of between 10 and 15 years have been suggested. The demonstration that seedling material may be kept potentially rootable for at least 6 months, by keeping the seedling shorter than the critical 12-15 nodes, is important. It is possible that with an extension of the hedging technique clones may be kept in a rootable condition for 4 or 5 years, sufficient time to make a reasonable assessment of the worth of a particular clone.

The ability of at least some older trees to produce basal coppice after semi-girdling opens up the possibility of producing clones of selected parents for use in a seed orchard. As it is a non-destructive technique and removes any possibility of the incompatibility problem experienced with grafting it is most attractive. However, further work on time of rooting and subsequent growth of the rooting cuttings needs to be done.

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## REFERENCES

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