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PILOT-SCALE TRIALS FOR ROOTING OF *EUCALYPTUS* CUTTINGS

TREVOR FAULDS

REPORT NO. 10 MARCH 1993

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EXECUTIVE SUMMARY

Small-scale trials have been tried each year since 1990-91 to develop methods for rooting cold-tolerant *Eucalyptus* species such as *E. nitens* and *E. fastigata*. Trials in 1991-92 showed promising results using semi-starved seedlings as stock plants.

This technique was tried on a small scale again in 1992/93, using levels of Magamp ranging from 0.18 g to 4 g for containerised stock plants. Also size of cutting (1 or 2 nodes) and removing half of each leaf were tried with *E. nitens* and *E. fastigata*. Restricting nutrients to 0.72g Magamp per plant or less gave good rooting success, with up to 60% for *E. fastigata* and 44 % for *E. nitens*, compared with less than 5% for full nutrient controls. Cutting size and root trimming gave no large differences in rooting success.

These promising results should be repeated on a larger scale to optimise rooting success.

PILOT-SCALE TRIALS FOR ROOTING OF *EUCALYPTUS* CUTTINGS

T. Faulds

Background to *Eucalyptus* Cutting Work

In 1990-91, small trials were carried out on the rooting of cuttings of *E. regnans, E. fastigata* and *E. nitens* (blue strain).

A "full nutrition" system that has proved successful overseas on tropical and sub-tropical species was used. This system has never proved successful on cold tolerant species.

Overall results of the 1990-91 trials were:

E. regnans	→	29% rooting
E. fastigata	→	0% rooting
E. nitens	→	4% rooting

No. of cuttings?

With nearly all the past propagation systems developed at NZFRI, the main factor in a successful system has been the lessening or removal of physiological and environmental stress to a stage by which the material being propagated can return to a normal growth pattern rapidly.

Not in agreement

Work in raising starved and semi-starved seedlings of cold-tolerant species suggested that some of the characteristics and behaviour patterns of starved *Eucalyptus* seedlings may be of benefit to a cutting propagation system.

In 1991-92, cutting material from semi-starved seedlings was used as a material source.

Overall results of the 1991-92 trials were:

E. regnans (starved)	→	64% rooting
E. regnans (high nutrient)	→	33% rooting
E. fastigata (starved)	→	78% rooting
E. fastigata (high nutrient)	→	Not tested

1992-93 Trial

Method

Seed of *E. fastigata* and *E. nitens* was soaked for 24 hours and sown late July. Seedlings were pricked out three days after germination into a 3 peat: 1 pumice mix. The fertiliser additions consisted of Magamp incorporated into the growing mix at 4 different levels, i.e.

Treatment 1	→	1 kg Magamp/m^3 in Hillson rootrainers	(0.18 g/plant)
Treatment 2	→	2 kg Magamp/m^3 in Hillson rootrainers	(0.36 g/plant)
Treatment 3	→	3 kg Magamp/m^3 in Hillson rootrainers	(0.54 g/plant)
Treatment 4	→	4 kg Magamp/m^3 in Hillson rootrainers	(0.72 g/plant)
Treatment 5	→	4 kg Magamp/m^3 in 1 litre pots	(4 g/plant)

Iron chelate and "Response black label" were applied 1 and 2 weeks after pricking out to all seedlings. Treatment 5 was given this treatment every 10 days until cutting harvest. For each fertiliser regime, 4 treatments were applied to cutting material, i.e.

Full leaf – 1 cutting node
Full leaf – 2 cutting nodes
½ leaf – 1 cutting node
½ leaf – 2 cutting nodes

The "½ leaf" treatments were applied 7 days before cuttings were collected. Cuttings were set in December 1992 in 1 litre containers (4 cuttings/container)

Environment

Containers of cuttings were placed outside under 30% shade. Containers were sitting on a heated sand bed that kept soil temperature at approx. 18°C. Mist was given for 4 seconds every 15 minutes of daylight hours, regardless of weather pattern. At night 5 seconds of mist was applied every hour.

Development of Cuttings

1. Immediately after setting, both species in treatment 5 showed loss of gloss on leaves, which is usually associated with plant stress. No "colour" changes were noted in treatments 1 to 4.

2. Three weeks after setting, treatment 5 leaves has recovered their "colour". Leaves that did not recover were shed (especially with *E. nitens*).

3. Six weeks after setting, roots had appeared from the bottom of the containers in all the starved treatments.

Notes at Assessment

1. Treatments 1 to 4 had less "coral callus" than cuttings of treatment 5.

2. In treatments 1 to 4, roots appeared from the callus and the stem and were vigorous.

3. Top growth appeared more sure and healthy in treatments 1 to 4 than treatment 5.

Results and Discussion

A summary of the results is given in Table 1, and full results for *E. nitens* are given in Appendix 1 and for *E. fastigata* in Appendix 2.

Starving of donor plants is beneficial to rooting cuttings from seedlings of *E. nitens*, *E. fastigata*. It should be noted that the *Eucalyptus* seedlings are "eased" into a starved state by both root restriction and nutrient levels. Experience has shown that any short, sharp

shock (such as severe root pruning) to induce hardiness and/or starvation can result in loss of leaves from the donor plants.

TABLE 1: Summary of results for *Eucalyptus fastigata* and *E. nitens* cutting trial

Fertiliser regime	*E. fastigata* % rooting	*E. nitens* % rooting
1	60.4	35.4
2	54.2	27.1
3	50.0	43.7
4	31.2	29.2
5	2.1	4.2
½ leaf *	54.2	37.5
full leaf *	43.7	30.2
1 leaf whorl	47.9	35.4
2 leaf whorls	50.0	32.3

* Does not include Treatment 5

In many cases, especially in *E. fastigata,* roots appeared from the stem rather than from the callus (in starved plants only). Callus formation was less prominent (coral callus) in the starved cuttings, than in the controls. Tap growth on the starved rooted cuttings appeared stronger than on the controls.

The best fertiliser treatment with *E. fastigata* was 0.18 g Magamp per plant, and for *E. nitens* was 0.54 g Magamp per plant. However, this was only a pilot trial and there was not a consistent trend between species and fertiliser level. There was little difference in the effect of using cuttings with 1 or 2 leaf whorls or with having whole leaves or leaves half removed. Further larger scale trials will be needed to refine the optimum treatments for each species.

APPENDIX 1

E. nitens (Each Treatment 12 Cuttings)

Nutrient treatment	Leaf	Leaf whorls	Rooted
1	Control	1 2	4 2
1	½ leaf	1 2	5 6
2	Control	1 2	2 2
2	½ leaf	1 2	7 2
3	Control	1 2	6 5
3	½ leaf	1 2	4 6
4	Control	1 2	3 5
4	½ leaf	1 2	3 3
5	Control	1 2	0 1
5	½ leaf	1 2	1 0

APPENDIX 2

E. fastigata (Each Treatment 12 Cuttings)

Nutrient treatment	Leaf	Leaf whorls	Rooted
1	Control	1 2	6 5
1	½ leaf	1 2	8 10
2	Control	1 2	8 9
2	½ leaf	1 2	5 4
3	Control	1 2	3 3
3	½ leaf	1 2	8 10
4	Control	1 2	3 5
4	½ leaf	1 2	5 2
5	Control	1 2	0 1
5	½ leaf	1 2	0 0