SEEDLING VARIATION IN ROOT FORMATION OF *EUCALYPTUS GLOBULUS* CUTTINGS

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Abstract. Cuttings of *Eucalyptus globulus* seedlings from a number of Tasmanian provenances were examined to assess inter and intra provenance differences in root production When grown under glasshouse conditions with bottom heat there were no significant differences in the rooting ability of cuttings between provenances However, within provenances there was a large amount of variation among individual seedlings Also, there were large differences in the number of roots produced on rooted cuttings. For clonal plantations of *E. globulus* intensive selection for easy propagation of cuttings is mandatory

REVIEW OF LITERATURE

With eucalypts, successful propagation of cuttings is affected by·

1) Individuals within a species (3, 6).
2) Juvenility, which encompasses position of the cutting on the mother plant (1, 7, 8), and the age of material used for the cutting (3, 4, 8).
3) Seasonal effects (2, 5).
4) Physiological condition of the mother plant (5).

The aim of this work was to investigate both inter and intra provenance differences in the rooting of *E. globulus* cuttings in order to identify seedlings with good rooting ability. The long term aim is to develop a commercial system for the production of cuttings to be used for clonal eucalypt plantations in Tasmania.

MATERIALS AND METHOD

Experiment 1. Inter-Provenance Effects. Nine provenances of *E. globulus* (King Island, North Flinders Island, St. Helens, Scamander, Seymour, Swansea, Jericho, Bruny Island, and Channel), (Figure 1), with 10 replicates and 5 cuttings per replicate were tested. Two or three leaf pair cuttings were taken at node 2 from 5 to 6 month old seedlings.

Leaves were trimmed and cuttings were placed in a fungicide solution (0.025% benomyl) before the base of the cuttings were dipped in IBA-talc (0.8%). Cuttings were then planted in a peat:perlite:sand (2:2:1) mix in individual pots (6cm x 7cm) and placed under intermittent mist. The cuttings were arranged in randomised blocks in a polythene tunnel without bottom heat. Cuttings received a weekly fungicide spray and were assessed after 6 weeks. Exp. 1 was carried out during late summer, February and

March, 1988; maximum temperatures ranged from 17 to 29 °C (mean 24.6 °C) and minimum temperatures ranged from 5 to 15 °C (mean 11.8 °C). Rooting success was calculated as the number of cuttings rooted/the number surviving at assessment and expressed as a percentage for each replication. An arc sine transformation was performed on the data.

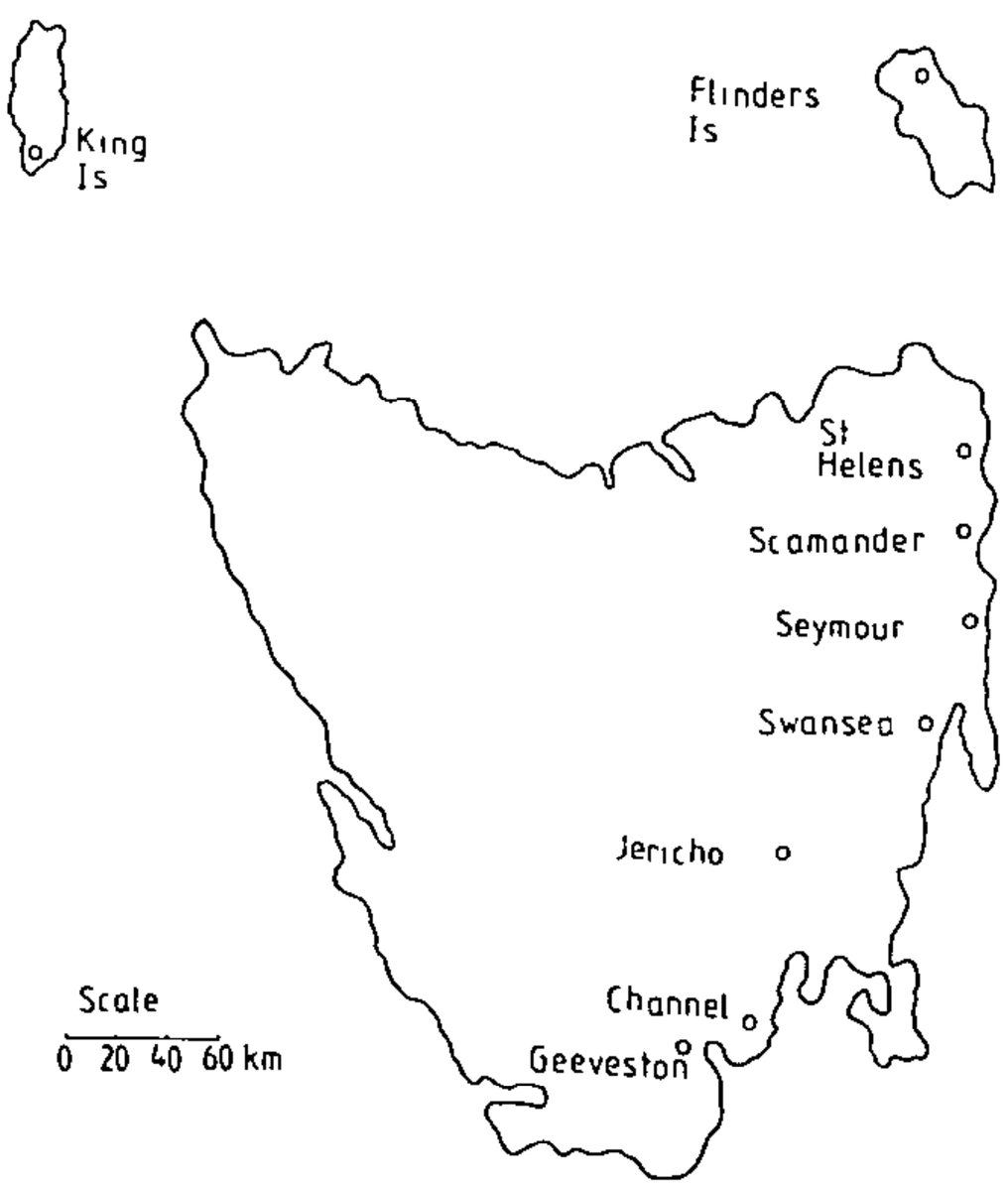

Figure 1. Location of *E globulus* Provenances in Tasmania

Experiment 2. Intra-Provenance Effects. Four to five month old seedlings from 5 provenances (St. Helens, Seymour, Scamander, Channel and Geeveston) were treated as for Experiment 1 except for a few details. Six seedling trees from each provenance were included with each group consisting of 6 replicates (each containing 5 cuttings per replicate). A vermiculite·perlite mix (1:1) was used as the rooting mix as this has been found to be more successful than the mix used in Experiment 1. Cuttings were placed in a glasshouse supplied with bottom heat (25 °C) and were assessed after 24 days. Experiment 2 was conducted in the autumn, April and May, 1989, with maximum temperatures ranging from 17 to 26 °C (Mean 22.8 °C) and minimum temperatures ranging from 7 to 16 °C (mean 12.3 °C). In order to detect differences in the amount of roots formed, the mean number of roots produced per rooted cutting was calculated.

RESULTS

There were large differences in the rooting success of cuttings taken from seedlings from different provenances in Experiment 1 (Table 1.) In Experiment 2 there were no significant differences in the rooting ability of cuttings from the 5 different provenances (Table 2), however, intra provenance differences were evident (Table 3).

A positive relationship between percent rooting success (y) and the number of roots produced for the successful cuttings (x) was established (1ny = A + Blnx; r = 0.725).

Table 1. Rooting success (transformed data) of a number of *E globulus* provenances, 6 weeks after setting (Exp 1)

Provenance	Rooting success (degrees)
Channel	5 0a *
N Flinders Island	5 5a
St Helens	24 2b
King Island	35 8bc
Swansea	36 5bc
Bruny Island	39 7c
Scamander	57 9d
Jericho	60 1d
Seymour	64 1d

Each value given is the mean of 10 replicates

* Means for each provenance having the same letter are not significantly different at the 5% level

Table 2. Rooting success of seedling cuttings from 5 *E globulus* provenances, 24 days after setting (Exp 2)

Provenance	Rooting success (degrees)	Mean number of roots/rooted cutting
Geeveston (G)	54 0	8 2
St Helens (SH)	59 9	8 4
Scamander (Sc)	60 6	8 4
Seymour (S)	63 5	9 9
Channel (C)	63 8	10 0
LSD 5%	11 9	3 0

Each value given is the mean of 36 replicates

Table 3. Rooting success of seedling cuttings of 6 different sources from 5 provenances (Exp. 2)

Source		Rooting success (degrees)	Number of roots/rooted cutting
S	3	60 9	7 9
	5	72 5	9 4
	11	64 0	18 1
	12	85 0	10 7
	16	30 9	1 8
	17	68 0	11 6
Sc	2	71 7	14 4
	7	55 0	6 1
	6	33 4	5 8
	10	34 0	4 3
	11	85 6	8 6
	13	83 5	11 1
SH	1	54 1	2 3
	5	65 8	5 7
	6	60.0	10 4
	7	61 5	10 6
	8	61 7	10 4
	10	56 3	11 3
C	2	59 0	4 8
	3	80 6	17 5
	5	60 0	6 4
	7	54 9	9 0
	8	72 7	9 6
	9	55 6	13 0
G	4	38 4	4 9
	7	34 1	4 3
	8	64 4	7 0
	10	62 8	11 7
	13	66 5	14 1
	14	57 8	7 5
LSD 5%		26 2	6 2

Each value is the mean of 6 replicates

DISCUSSION

These experiments demonstrate two important points about the clonal propagation of *E. globulus*. Firstly, Experiment 1 shows that there are significant differences among provenances in the ability of cuttings to produce roots under minimal controlled environmental conditions. In Experiment 2, where environmental conditions were less variable, differences among provenances were not apparent. However, between trees within these provenances significant differences were noted From this it appears that bottom heat is very important for the successful propagation of *E globulus* cuttings and some specific clones may have differing environmental requirements for successful propagation. Temperatures above

28 °C are also thought to be detrimental to rooting *E. globulus* cuttings.

The identification of seedlings whose cuttings show poor rooting indicates the need for greater research to improve rooting ability in these clones; otherwise favourable characteristics that they may possess could be lost from the genetic improvement program. The importance of maintaining genetic diversity in tree breeding has been stressed by van Wyk (9). Once good rooting trees and individual clones are identified they can be utilised in the breeding program to increase the rooting ability of inter and intra specific crosses.

Commercial clonal forestry with this species will require both good environmental control for the propagation of cuttings and sufficient numbers of clones that are easily propagated.

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