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PRELIMINARY GROWTH PERFORMANCE OF *Eucalyptus microcorys* PROVENANCES IN THE UP-COUNTRY INTERMEDIATE AND WET ZONES

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Abstract

Eucalyptus microcorys is the main forest plantation species producing high quality timber in the wet and intermediate zones of the up-country of Sri Lanka. Very few attempts have been made in the past to select genotypes of this species for better growth and timber yield. Two field trials have now been made with six seedlots from the CSIRO, Australia. The first experiment, at Dixon's Corner in the up-country wet zone, showed that the provenance "NW of Wauchope" (New South Wales) performed well compared with the local landrace. The second experiment was established in both the dry and wet zones of the up-country. The provenances "Kendall" from New South Wales and "11 km W of Beerbu" from Queensland performed well in the wet zone, compared with the other tested provenances, but in the intermediate zone the growth rates of the imported provenances did not show any remarkable differences from that of the local landrace.

Introduction

Eucalyptus microcorys F.Muell. is naturally distributed in northern coastal New South Wales, and in southeastern Queensland between the coastal zone and the higher altitudes (Boland et al. 1984). It was introduced to Sri Lanka in 1880 and has been used as a plantation tree in the up-country wet zone since 1930 (Webb et al. 1984; Streets, 1962). According to Bandarathilaka (1994) 700-800 ha have been planted, it is planned to make more plantations with this species under the reforestation programme, and many plants will also be raised for home gardens and farm woodlots. The timber is in high demand for heavy construction work, because of its high density, durability and workability. Even though a fairly long rotation of 30-35 years is needed, farmers like to plant it in their home gardens because of the eventual high economic return.

In the past no improvement work was done on *E. microcoryd* in Sri Lanka, because it was not considered to be a priority species. In an early attempt to improve the seed sources, existing plantations of good performance were identified in the up-country intermediate and wet zones, at Diyatalawa and Dansinan respectively. They were selectively thinned to form seed-production stands. The seed origin of these plantations is not known.

The study reported here tested different provenances from Australia. Preliminary results are now available.

Materials and methods

Experiment 1

Seed of eleven provenances of *E. microcorys* were received from CSIRO, Australia and were sown in the departmental nursery at Mahakudugala, Nuwara Eliya. Because of the very poor germination of the seedlots, only three provenances gave sufficient seedlings to use in the experiment. Table 1 lists the provenances used, ie the three from Australia and a local collection of *E. grandis* for comparison.

Table 1 : Description of seedlots used in Experiment 1

	Seedlot No.	Provenance	Lat.	Long.	Alt. (m)
1	17136	Kenilworth State Forest, Qld.	26°41'S	152°35'E	650
2	13972	NW of Wauchope, NSW	31°13'S	152°21'E	760
3	15250	Nambour, Qld.	26°40'S	152°55'E	45
4	Local	*E. grandis*, Mahakudugala	7°08'N	80°81'E	1050

These provenances were planted in 1992 at Dixon's Corner in Nuwara Eliya District, in a randomized complete block design with three replications. The spacing was 2.5 × 2.5 m, in 25-tree plots.Table 2 gives a description of the locality.

Table 2 : Particulars of the trial site, Experiment 1

Location:	Dixon's corner, Nuwara Eliya
Latitude:	7°8' N
Longitude:	81°8' E
Altitude:	1350 m
Soil:	Red-yellow podzolic, quite deep and fertile
Mean annual rainfall:	>2000 mm
Site condition:	*E. grandis* clear-felling site

Two years after planting, it was observed that some seedlots been mixed with local *E. grandis*. The mixing could have happened in the nursery; the soil use had been collected from the adjoining *E grandis* plantation and could have contained seed.

The *E. microcorys* trees were separated from *E. grandis* trees, and tree height and dbh were measured four years after planting. Because of the missing data, general linear modelling was used to compare variation between provenances.

Experiment 2

Another five seedlots of *E. microcorys* were received from CSIRO, but ony three were germinated and were used in Experiment 2, along with two local seedlots. Table 3 gives the provenance information.

Table 3 : Description of seedlots used in experiment 2

	Seedlot No.	Provenance	Lat.	Long.	Alt. (m)
1	13971	NNE of Kendall, NSW	31°34′S	152°47′E	40
2	15527	Kendall, NSW	31°34′S	152°41′E	180
3	15607	11 km W of Beerbu, Qld.	26°56′S	152°52′E	120
4	Local	*E.microcorys*, Erabedda	6°9′N	81°8′E	1000
5	Local	*E. grandis*, Erabedda	6°9′N	81°8′E	1000

The seeds were sown in the nursery at Agaratenna, Badulla. The initial growth in the nursery was excellent. Planting was in complete randomized blocks with four replications, in two different up-country ecological sites representing the intermediate and wet zones. Table 4 gives descriptions of the localities.

Table 4 : Particulars of the trial site, Experiment 2

		Site 1	Site 2
1	Location and climatic zone	Up intermediate, Erabedda	Up wet, Mahakudugalla
2	Latitude and longitude	6°9′N, 81°1′E	6°8′N, 80°9′E
3	Altitude, metres	950	1550
4	Soil group and condition	Red-yellow podzolic, fairly degraded, shallow	Red-yellow podzolic, fertile and quite deep
5	Mean annual rainfall, mm	1750-2000	>2000
6	Site condition	Abandoned tea land	*E.grandis* clear-felling site

The trials in both locations were planted in November 1994, during the northeast monsoon. All treatments were planted at a spacing of 2.5 × 2.5 m, in 25-tree plots. Four weedings were done in the first two years and a general fertilizer mixture was applied, at the rate of 50 g per plant, at the beginning of each monsoonal rains.

An assessment was made of survival two months after planting, and a preliminary growth assessment, in terms of tree height and dbh, two years after planting, in 1996.

Results and discussion

Experiment 1

Table 5 shows the results four years after planting. General linear modelling was done to test the variation between provenances and Duncan's range test was used to compare the treatment mean differences.

There is a significant difference between *E. grandis* and *E. microcorys*. The provenance "NW of Wauchope" from a high altitude area of NSW performed well in regard to height growth, compared with the other tested provenances.

Table 5: Height and dbh 4 years after planting, Experiment 1

Seedlot No.	Provenance	Mean total height (m)	Duncan 's test	Mean dbh (cm)	Duncan's test
13972	NW of Wauchope, NSW	9.63	ab	8.2	ab
15250	Nambour. Qld.	8.34	ab	8.8	ab
17136	Kenilworth State Forest, Qld.	6.54	b	6.5	b
Local	*E. grandis*, Newara Eliya	12.4	a	10.6	a
Probability		0.06		0.07	
CV %		18.56		15	

Experiment 2

Height and dbh were measured at both sites two years after planting. The ANOVA test was applied to the results. The site factor/provenance interaction in the combined analysis was significant at the probability level of 95% (Table 6).

Table 6 : Results of the combined analysis

Source	Df	Ms	Fval	Pr> F
Site	1	110.82	1518.62	0.001
Block	3	0.12	1.7	0.19
Provenance	4	2.5	34.27	0.0001
Site × prov.	4	0.78	10.74	0.0001

Because of the significance of the interaction between sites and provenances, two separate analyses were performed for both sites. The results are given in Table 7

On both sites the growth of *E. grandis* was significantly greater than that of *E. microcorys*. Both species showed significantly different yields (probability 0.0001) in the different climatic zones. The mean height and dbh at Mahakudugala two years after planting were 4.25 m and 6.43 cm, while at Erabedda they were only 0.93 m and 1.5 cm. A survival assesment four months after planting was done.

In the up-country wet zone at Mahakudugala all provenances from Australia performed well compared with the local landrace. The Kendall provenance from New South Wales (15527) outperformed the other provenances tested. It seems that in this zone high-altitude and high-latitude provenances perform well compared with those from lower altitudes and lower latitudes.

Table 7 : Height and dbh growth of different provenances of *E. microcorys* and *E. grandis* at Erabedda and Mahakudugalla (Experiment 2)

		Erabedda		Mahakudugula	
Seedlot No.	**Provenance**	**Mean height (m)**	**Mean dbh (cm)**	**Mean height (m)**	**Mean dbh (cm)**
13971	NNE of Kendall, NSW	0.97 b	1.4 b	3.86 bc	5.87 b
15527	Kendall, NSW	0.88 b	1.2 b	4.26 b	6.13 b
15607	11 km W of Beerbu, Qld.	0.83 b	1.3 b	3.98 bc	6.13 b
Local	*E. microcorys*	0.67 b	1.2 b	3.45 c	5.65 b
Local	*E. grandis*	1.35 a	2.45 a	5.73 a	8.35 a
	Probability	0.001	0.0001	0.0001	0.0004
	CV %	17.6	16.61	8.22	9.84

In the intermediate zone there was a significant difference between the two species, and all imported provenances of *E. microcorys* showed higher growth rates than the local landrace, but no significant differences could be found between the Australian provenances.

Conclusions

- *E. microcorys* is slow growing compared with *E. grandis*.
- The growth of *E. microcorys* in the up-country intermediate zone is much slower than in the up-country wet zone.
- The growth performances of different provenances of *E. microcorys* in both climatic zones are different, or else the site/provenance interaction is significant.

• Provenances from high altitudes and high latitudes areas perform well in the up-country wet zone. More provenances from those areas should be tested before a strong recommendation is made for this particular area of Sri lanka.

• The provenances from Kendall, New South Wales; "11 km W of Beerbu", Queensland; and "NW of Wauchope", New South Wales are promising provenances for the immediate seed requirements in the up-country wet zone reforestation areas.

• It is necessary to test more provenances of this species in the up-country intermediate zone.

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