Blue gum on the basalt plains at 5 years: *Effects of ripping, mounding and fertiliser*

Tim Jackson, Rod Bird and Reto Zollinger, Agriculture Victoria, Pastoral and Veterinary Institute, Hamilton

This article reports growth of 5-year-old blue gum *(Eucalyptus globulus spp. globulus)* on a well-drained hill crest located 10 km south of Hamilton on the basaltic plains of SW Victoria (Figure 1). One aim is to compare 5-year data with earlier results. Early growth data (10 and 23 months) and experimental design were reported in detail by Bird et al. (2000). Data reported here were collected in July 2001, when we thought that trees on the hill crest site may have reached maximum growth rates and competition thereafter would become intense due to the depletion of soil water stored previously under pasture. The data may also form a basis for future analyses, as additional fertiliser was applied to the sites after measurement.

Materials and methods

The ground preparation treatments were control, rip, rip plus small mound (20 cm x 40 cm) and rip plus large mound (60 cm x 150 cm). Ripping was to 65 cm depth with a winged ripper. Fertiliser treatments were nil, 125, 250 and 500 g of NPKS fertiliser (Pivot 800) per tree, applied 2 months after planting. Two seedlots were used: Yeodene Seed Orchard and Otway Ranges, Lorne. Seedlings were planted in September 1996 at 4 m x 2 m spacing (1250 seedlings/ha). There were five replicates and the experimental units were line-plots of 10 trees. There were three buffer rows around the sites, with two buffer rows between the blocks. The buffer trees were of King Island provenance, on a rip plus small mound, with no fertiliser.

At 57 months, we measured diameter over bark at 1.3 m above ground (dbh) and height of 8 trees per line-plot (one tree at each end was excluded). Sixteen King Island buffer trees at each of 10 locations were also measured, for comparison with adjacent Yeodene or Otway Ranges trees on the same treatments. Dead or missing trees were excluded from the data. Stem volume/ha for a full stocking of live trees was calculated, assuming a conical stem shape.

Results and discussion

Mean stem volume for the site was 85 m^3/ha or a mean annual increment (MAI) of 18 m^3/ha (80 m^3/ha and 17 m^3/ha, respectively, if missing/dead trees are included). ForestrySA's most productive sites had considerably greater MAIs of 30 m^3/ha at 7 years where planted over a shallow water table (Anon. 2000). However, our results represent good growth for a site where average annual rainfall over the last five years was 620 mm.

Overall survival was 95%, with 36% of the losses occurring in the last two years. These recent deaths were smaller trees that probably suffered strong competition for water.

There were significant differences ($P<0.001$) in diameter and volume between ground preparation treatments (Table 1, Figure 2). The ranking was rip plus large mound, rip only, rip plus small mound, control. The results at 5 years are different to results at 2 years in several respects:

1. The rip-only treatment was better than the control treatment, whereas that difference was not significant at 2 years.
2. The rip-only treatment was better than the rip plus small mound treatment, whereas that difference was not significant at 2 years.
3. Stem volume on the rip plus large mound was 8.6% greater than on the control treatment, whereas that difference was 22% at 2 years.

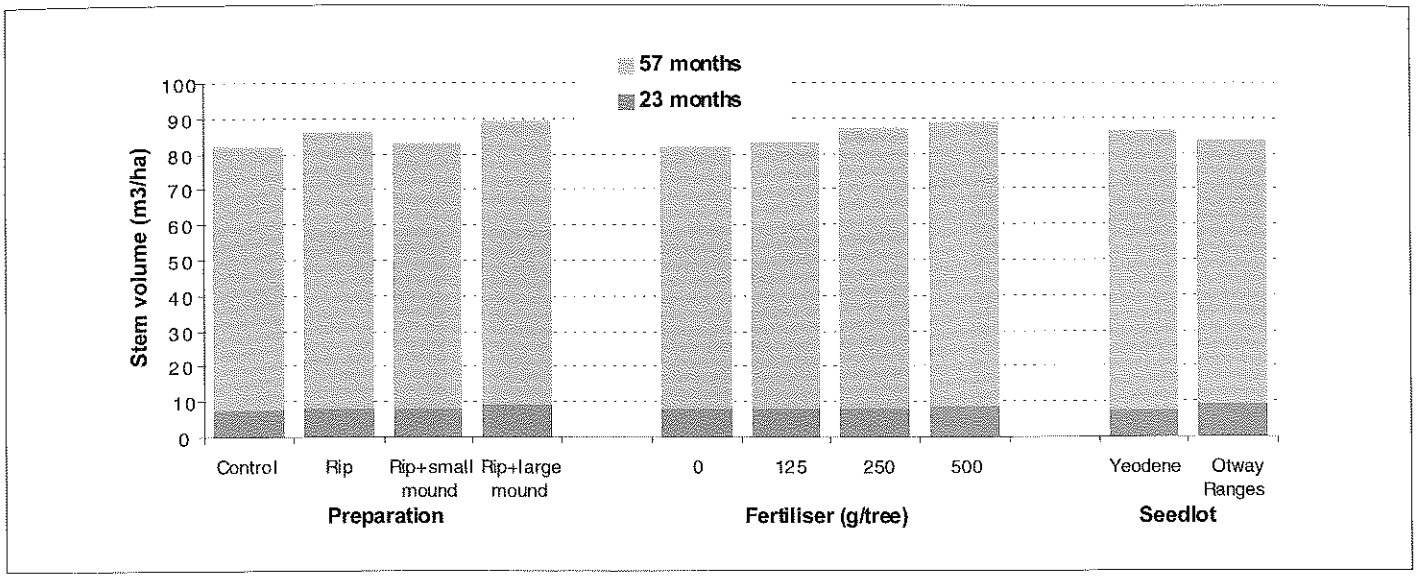
Lacey et al. (2001) reported a greater response to ripping and mounding in *E. pilularis* up to age 19 months, near Kempsey in northern NSW. Trees on their control treatment had an average height of about 1.6 m, compared to 3.4-4.0 m on the rip plus mounded treatments. In contrast, our trees at 23 months were 4.1 m tall on the control treatment and 4.3 m on the rip plus large mounds.

Fertiliser effects on growth were not statistically significant, consistent with results at two years. Recent years have been dry and low rainfall has probably imposed far greater limits on growth. Additional fertiliser

Table 1: Transformed survival (TrSurv), survival (sample means), volume, height and dbh of PVI blue gums at 57 months.

Factor	Treatment	TrSurv	Survival (%)	Volume (m^3/ha)	Height (m)	dbh (mm)
Preparation	Control	83	95	82	12.5	124
	Rip	84	96	86	12.7	126
	Rip+small mound	85	96	83	12.4	124
	Rip+large mound	81	94	89	12.5	129
	l.s.d.	4.0		2.8	0.26	1.8
Fertiliser	0	82	94	82	12.3	125
(g/tree)	125	84	96	83	12.4	125
	250	85	97	87	12.6	127
	500	83	95	89	12.8	128
	l.s.d.	4.9		10.2	0.60	6.4
Seedlot	Yeodene	79	92	87	12.7	126
	Otway Ranges	88	99	84	12.3	125
	l.s.d.	3.4		7.2	0.42	4.5

Figure 2: Stem volume of PVI blue gums at ages 23 and 57 months.



(0, 375, 750 or 1500 g/tree of Pivot 900) was applied in August 2001. The ample spring rainfall in 2001 may give fertilised plots a growth advantage that future measurements will identify.

There was a weak trend for better growth of Yeodene trees than Otway Ranges trees. However, survival was significantly lower ($P<0.001$) for the Yeodene seedlot, and if this was taken into account, mean growth of the two sources was not significantly different. There was no significant difference between growth of King Island trees (83 m^3/ha) and Yeodene (79 m^3/ha) or Otway Ranges (73 m^3/ha) trees.

Results over the next five years will be interesting. Will the trees exhaust the soil water, leading to suppressed growth and /or death? What are the implications for a second rotation? Will a pasture phase be necessary, for regain of soil water?

Conclusions

Results at year 5 are generally consistent with those at year 2, although the relative differences among site preparation treatments are decreasing. The main results are:

- Fertiliser had no significant effect on tree growth.
- Rip plus large mound treatment resulted in better growth than other site preparations (8.6% greater than control).
- Ripping significantly improved growth, when compared to control preparation (5% increase).
- Growth was not significantly different among Yeodene, Otway Ranges and Kangaroo Island sources.

References

Anon. (2000) Notes from ForestrySA Soils Productivity Field Day.

Bird PR, Jowett DW, Jackson TT, Kearney GA, Waters MJ and Measki B (2000) Early growth responses of blue gums on the basaltic plains to ripping, mounding and fertiliser application. *Aust. J. Exp. Agric.* 40, 987-994.

Lacey ST, Brennan PD and Parekh J (2001) Deep may not be meaningful: Cost and effectiveness of various ripping tine configurations in a plantation cultivation trial in eastern Australia. *New Forests* 21, 231-248.

Figure 1: A 5-year-old plantation established at PVI in 1996. From left to right, the treatments are control, rip only, rip plus large mound and rip plus small mound.