SEVEN-YEAR GROWTH RESPONSE OF RADIATA PINE TO AREA OF HERBACEOUS WEED CONTROL

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A trial was established at Rangiora Nursery, North Canterbury, in 1984 to evaluate the early growth response of radiata pine (*Pinus radiata*) to different levels of herbaceous weed control. Treatments included releasing trees by spot treatment with hexazinone (3.6 kg/ha) applied to spots of 0.5, 0.75 and 1.0 m radius; to strips 2 m wide or over the total area; regular monthly mowing (for 24 months after planting); untreated control.

In the sprayed treatments total weed control was achieved for the first growing season. Californian thistles (*Cirsium arvense*), dock (*Rumex obtusifolius*) and plantain (*Plantago lanceolata*) were the first plant species to colonise the sprayed areas after 12 months. Timothy (*Phleum pratense*), Yorkshire fog (*Holcus lanatus*), red clover (*Trifolium pratense*), and cocksfoot (*Dactylis glomerata*) had re-established after 15 months and quickly formed a dense sward around the trees.

Tree survival, stem diameter (at 1.4 m above ground level) and stem height were re-measured 7 years after planting. Mean stem volume (basal area (m²) x mean height (m) x 0.38) and total stand volume (mean stem volume x 400 stems/ha) were calculated. These measures of tree response were tested by analysis of variance (ANOVA) and the means were compared by Duncan's Multiple Range test.

Tree survival exceeded 95% in all treatments, reflecting the good quality of seedling stock used and the care taken in planting. Growth gains did not differ between the regularly mown and 0.5 m spot treatment, but increasing the size of the spot to 0.75 or 1.0 m radius resulted in significant growth gains (Table 1). Further gains were made by strip spraying and by total vegetation control.

TABLE 1: Radiata pine growth response to area of weed control, 7 years after treatment (planted 1984)

Measured parameter	Untreated	Mown	Spot treatments				Strip 2 m	Total weed control
			0.5 m	0.75 m	1.0 m			
Diameter (cm)	11.4a*	14.5b	14.5b	15.7c	17.5d	18.8e		19.5f
Height (m)	5.5a	6.6b	6.9b	7.4c	7.9d	8.8e		8.9e
Stem volume (m ³)	0.0215a	0.0418b	0.0431b	0.0546c	0.0725d	0.0932e		0.1008e
Vol/ha (400 stems/ha)	9a	17b	17b	22c	29d	37e		40e

* For each measured parameter, data sharing common postscripts are not significantly different at the 5% level.

The costs of increasing the size of spot were more than offset by gains in volume growth, and strip spraying was more cost-effective than spot treatments, 7 years from planting (Table 2). However, strip spraying may not always be practical because of terrain. Although blanket spraying gave considerable growth gains, it was the least cost-effective treatment because of the high cost of the chemical. Total vegetation

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control may well be a feasible option if a cheaper, but equally effective, herbicide is used. However, where it is desired to graze livestock, total vegetation control would be inappropriate.

TABLE 2: Chemical cost and percent volume increase for spraying options¹

Treatment	Quantity hexazinone ² (kg product/ha)	Cost (including application) ³ (\$/ha)	Volume at age 7 (400 stems/ha) (m ³ /ha)	% Volume gain	Cost/m ³ wood produced (\$)
untreated	0	0	9	0	
spot 0.5 m radius	0.25	76	17	89	4.5
spot 0.75 m radius	0.56	100	22	144	4.5
spot 1.0 m radius	1.0	148	29	222	5.1
strip (2 m width)	1.14	128	37	311	3.4
total vegetation control	4.0	449	40	344	11.2

¹ assuming initial tree stocking of 800 seedlings/ha planted in rows 7 m apart

² Velpar 90 WSP

³ Spot spraying cost = \$52/ha. Strip spraying = \$18/ha. Blanket application by helicopter applying 220 litres TSV/ha = \$64/ha. These are based on 1991 costs for North Canterbury forests.

The relative cost-effectiveness of the different treatments has changed since 1987 when spots of 0.5 m radius were the most cost-effective (Balneaves 1987), followed by strip spraying. This indicates that the traditional practice of assessing the effects of spray treatments for only 2 or 3 years does not reliably predict long-term results.

This trial will be remeasured at age 10 years to see if present growth trends continue.

REFERENCE

Balneaves, John, M., 1987. Growth response of radiata pine to area of herbaceous weed control. *Proc. 40th N.Z. Weed and Pest Control Conf.*: 49-51.