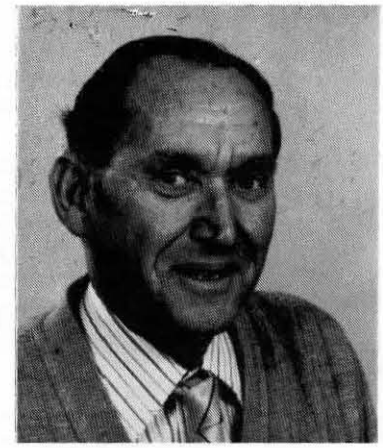
RESEARCH REPORTS (continued)



Control of *Eucalyptus populnea* F.Muell. (poplar box) using fewer chemical injection points

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Summary

The commercially accepted stem injection spacing of 12.5 cm of basal circumference has given high percentage kills with picloram over a wide range of eucalypt species. Wider spacing was investigated in an effort to reduce labour input required, with proportional increase in the amount of picloram injected per pocket. Injections were made close to ground level and at a height of 1 m to different trees of nine class sizes at 2-monthly intervals from September 1970 to July 1971 at the rate of one, two or four injections per tree or injections at 12.5 cm spacing. There was no difference between the high and low injection position, but the greater the number of injection pockets made the higher percentage kill as tree size increased. All treatments controlled all trees in the two smallest size classes.

Introduction

Problems of reducing tree densities and of controlling their regeneration on lands used for grazing have been discussed by Moore (1972). Stem injection with chemicals has been reported by Robertson (1966) and by Robertson and Moore (1972) to be an effective way of thinning bimble or poplar box (*Eucalyptus populnea* F. Muell.) shrub woodlands. They showed that the amount of active ingredient of the chemical is critical rather than the total volume of material injected. This paper gives results of an experiment in which a commercial formulation of picloram + 2,4,5-T was injected between bark and sapwood at one, two and four injections per tree and at the commercially recommended spacing of 12.5 cm of basal circumference to trees of varying sizes. The experiment includes comparisons of injections made close to ground level with those placed 1 m from ground level.

The labour input involved in the thinning of unwanted timber with herbicides constitutes approximately 65% of the total cost, so any saving in application time allows for the treating of a larger area. Rapid increases in labour costs since 1980 have led to renewed attempts to reduce the number of stem injection points in an effort to reduce the labour input in commercial tree thinning.

Methods

The experiment was conducted on Quemoi Station near Cecil Plains (latitude 27°50'S, longitude 151°30'E) in southern Queensland on a solodic soil (pH 6.5). Rain falls predominantly in the summer and averages 600 mm per annum.

Generally only single-stemmed trees with basal circumferences ranging from <42.5 cm–>130 cm were used, but in the later application dates some twin-stemmed trees were included because of lack of suitable trees.

The herbicide Tordon 105 (picloram + 2,4,5-T) was injected close to ground level using a Marino Tree Injector (blade width 2.5 cm) calibrated to deliver 2 mL per injection and with a modified axe (blade width also 2.5 cm) and vaccomatic syringe for injections 1 m above ground. Trees were divided into nine class sizes ranging from <42.5 cm up to >130 cm basal circumferences, each covering an increment of 10 cm. Two replications of ten trees within each class size received one, two or four injections or injections spaced at 12.5 cm intervals around the tree. A constant concentration of 2.0% Tordon 105 in water was used with the volume being adjusted according to the tree size so that trees of equal basal circumference received the same volume of chemical irrespective of the number or position of the injection points. This volume was based on what the tree would have received if it had been treated close to ground level at the commercially recommended spacing of 12.5 cm.

Treatments were applied during September and November 1970 and January, March, May and July 1971. The final data were collected 3 years after each application date, when if following death of leaves and twigs there was no resprouting, the trees were considered dead.

The experimental design consisted of randomized blocks with two replications. The time involved in applying the herbicide at the various injection spacing was recorded.

Results

The data were analysed using angular transformation, but the tables presented here show percentage kills for easier comparisons. The data for the two small tree size classes (<42.5 cm and 45–55 cm) have been excluded from the tables because all injection spacings gave a complete kill of trees at both high and low injection positions at each application time.

The results for all treatment dates (Table 1) show that the greater the number of injection points, the more effective the treatment as tree size increases. For the first four application

dates there were no differences between the high or low injection position, but for the May and July 1971 application dates the high injections were superior for the larger tree sizes (Table 2).

The variation in the time taken to apply the chemical to one, two or four injection pockets to poplar box trees of the various class sizes used is given in Table 3. This variation is expressed as a percentage of the time taken to treat each class size at the 12.5 cm injection spacing.

Discussion

The results indicate that Tordon 105 applied in water between bark and sapwood at the injection spacings, heights and times used can kill most mature single-stemmed poplar box trees. For applications made in September and November 1970 and January and March 1971 the greater the number of injection points, the more effective was the treatment as the tree size increased. High or low injection positions made no difference to this trend. Although the same effect applied in May and July 1971, fewer of the larger trees died and applications made 1 m above ground were more effective than applications made close to ground level (Table 2). This lower effectiveness of the low injections could in part be caused by having to use some twin-stemmed trees for these particular application dates.

Generally, when injections are made at the 12.5 cm spacing close to ground level to twin-stemmed trees they react similarly to single-stemmed trees, but if only one or two injections are made, regrowth often occurs on the inside of one or both stems. For the larger tree size studied (108 – >130 cm) the basal bark areas are generally thick and fibrous, making bark penetration with the tree injector difficult. Some herbicide can be lost on the dry bark material, causing a loss of effectiveness.

The reason for the poor results obtained for the one injection per tree and to a lesser extent two injections per tree for the March and May 1971 applications is obscure and is in variance with the findings of Robertson and Moore (1972), who found time of application generally did not affect results. One injection per tree for the tree size 58–68 cm basal circumference gave a mean percentage kill for all application dates of 88.0% compared to 99.5% for the 12.5 cm spacing. The latter interval requires an extra four injections which take approximately twice as long to apply as one injection placed low and 33% more time than for one injection placed high. Two injections per tree on the 83–93 cm trees gave a mean kill of 89.0% compared to 98.3% for the 12.5 cm spacing with a saving of five injections and a time saving of 40% and 10% for the low and high injection placement respectively. With the tree size 108–118 cm four injections gave a mean kill of 87% compared to 94.5% for the 12.5 cm interval, with a saving of five injections and 11% of time when placed low.

The time saved when employing the wider spacing technique over the closer spacing of 12.5 cm decreases with the increase in tree size. Injections placed low with the tree injector are quicker to apply than similar volumes placed high with the axe and vaccinator (Table 3), but as Table 2 shows, for the larger trees the high placement of the injection points gives an improved kill. The effect of the low injections would no doubt be considerably improved if the pockets were placed above the thick fibrous basal bark of these larger trees, say at 30–40 cm from ground level

Table 1 Mean effects of picloram applied at different injection intervals and two heights to mature trees of poplar box (*Eucalyptus populnea*) of varying class sizes

Application date	Injection spacing	Basal circumference measurement (cm) 58–68	70–80	83–93	95–105	108–118	120–130	>130	Mean
		Percentage kill							
September	1/tree	99.5	97.0	87.0	78.5	70.0	70.0	23.0	75.0
1970	2/tree	99.5	99.5	99.5	92.0	78.5	97.0	78.5	92.1
	4/tree	99.5	99.5	99.5	99.5	99.5	99.5	70.0	95.3
	12.5 cm	99.5	99.5	99.5	99.5	99.5	99.5	97.0	99.1
LSD = 9 (at 0.05 level)									
November	1/tree	92.0	92.0	78.5	60.5	41.5	32.0	23.0	59.9
1970	2/tree	99.5	97.0	87.0	87.0	87.0	78.5	41.5	82.5
	4/tree	99.5	99.5	97.0	92.0	92.0	99.5	92.0	95.9
	12.5 cm	99.5	99.5	99.5	99.5	99.5	92.0	97.0	98.1
LSD = 9 (at 0.05 level)									
January	1/tree	99.5	92.0	78.5	87.0	70.0	70.0	51.0	78.3
1971	2/tree	99.5	99.5	97.0	99.5	99.5	78.5	51.0	89.2
	4/tree	99.5	99.5	99.5	97.0	99.5	92.0	92.0	97.0
	12.5 cm	99.5	99.5	99.5	97.0	99.5	97.0	99.5	98.8
LSD = 4 (at 0.05 level)									
March	1/tree	70.0	60.5	32.0	32.0	23.0	9.0	4.0	32.9
1971	2/tree	99.5	97.0	70.0	60.5	60.5	41.5	32.0	65.9
	4/tree	99.5	92.0	92.0	78.5	51.0	60.5	60.5	76.3
	12.5 cm	99.5	92.0	92.0	78.5	92.0	70.0	78.5	86.1
LSD = 4 (at 0.05 level)									
May	1/tree	70.0	51.0	51.0	41.5	32.0	1.0	9.0	36.5
1971	2/tree	92.0	92.0	87.0	60.5	60.5	70.0	32.0	70.6
	4/tree	97.0	87.0	92.0	87.0	92.0	70.0	60.5	83.6
	12.5 cm	99.5	99.5	99.5	97.0	87.0	92.0	78.5	93.3
LSD = 9 (at 0.05 level)									
July	1/tree	97.0	87.0	78.5	60.5	51.0	32.0	9.0	59.3
1971	2/tree	99.5	99.5	92.0	87.0	70.0	60.5	41.5	78.6
	4/tree	99.5	99.5	99.5	99.5	87.0	92.0	87.0	95.0
	12.5 cm	99.5	99.5	99.5	97.0	97.0	92.0	92.0	96.6
LSD = 9 (at 0.05 level)									

LSD = least significant difference

Table 2 Effects (treatment means) of height of application of picloram when applied to mature trees of poplar box (*Eucalyptus populnea*)

Application height	Basal circumference (cm) 108–118	120–130	>130
	Percentage kill		
Treatments applied May 1971			
low	70.0	41.5	32.0
high	78.5	78.5	51.0
Treatments applied July 1971			
low	70.0	60.5	41.5
high	92.0	87.0	70.0

Table 3 Difference in time needed to treat mature trees of poplar box (*Eucalyptus populnea*) of varying class sizes at different injection intervals expressed as a percentage of the time taken to treat each class at the 12.5 cm spacing

Application height and spacing interval	Basal circumference measurement (cm)						
	58–68	70–80	83–93	95–105	108–118	120–130	130
	Percentage time saved						
low 1/tree	56	52	46	44	42	29	28
2/tree	25	35	40	39	33	37	35
4/tree	+11	9	11	20	11	11	24
high 1/tree	33	37	18	22	19	13	+2
2/tree	10	28	10	22	13	17	12
4/tree	+5	1	+2	16	+3	2	8

+ indicates an increase in application time compared to 12.5 cm spacing.

instead of as close to ground level as practicable.

At the 2.0% Tordon 105 solution used for all injections, no trouble was experienced in having the various volumes absorbed into the trees. For the 58–80 cm trees this volume was only 5 mL which increased by 1 mL per injection point for each 10 cm increase in tree size.

In summary, the evidence is that picloram + 2,4,5-T as Tordon 105 can control mature single-stemmed trees of poplar box when injected at much wider spacing intervals than currently used, providing the same amount of active ingredient of the chemicals is applied as would be used if the 12.5 cm spacing was used. The basal circumference measurement governs the number of injections to be made as there is a definite limit to the lateral movement of the chemical. Kills of 88% can be obtained with one injection per tree up to 68 cm in basal circumference; for trees in the 83–93 cm class size an 89% kill can be obtained with two injections, whilst four injections per tree gives an 87% kill on trees up to 118 cm basal circumference. Trees over this size and all multi-stemmed trees should be treated at the 12.5 cm spacing interval.

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