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EFFECT OF THE AMINE SALT OF PICLORAM AND 2,4-D AND OF THE BUTYL ESTER OF 2,4,5-T ON COOLIBAH (EUCALYPTUS MICROTHECA) SAPLINGS

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SUMMARY

In central Queensland *Eucalyptus microtheca* saplings were treated in April and July 1967 with the amine salt of picloram and 2,4-D and with the butyl ester of 2,4,5-T. Methods of application were cut stump, stem injection and basal bark spray. Picloram/2,4-D gave better kills than 2,4,5-T and was effective when applied by cut stump or stem injection, while 2,4,5-T was effective only when applied to the cut stump.

I. INTRODUCTION

In subcoastal central Queensland, coolibah (*Eucalyptus microtheca*) is found on the alluvial plains adjacent to the major rivers and streams. The tree layer is of medium height (9–15 m) and varies from very open to moderately dense (12–100 trees/ha). It grades into grassland, brigalow (*Acacia harpophylla*) and poplar box (*Eucalyptus populnea*) communities. The various coolibah communities have been described by Gunn *et al.* (1967), Story *et al.* (1967) and Speck *et al.* (1968).

Mass germinations of coolibah seedlings usually occur after major floods. The largest area of land flooded in central Queensland is in Area III of the Brigalow Development Scheme where Anderson (1970) estimated that 200 000 ha are liable to flooding. Anderson reported that coolibah seedlings had invaded previously open areas after floods in 1954 and 1958.

In 1967 at the start of this study 2,4,5-T butyl ester and the amine salt of picloram and 2,4-D ("Tordon 50D") were in common use for the control of woody weeds, with some successful results on trees and relatively large saplings of eucalypts reported by Young (1965) and Robertson (1966). The purpose of this study was to investigate the effects of the above chemicals, applied by three methods, on the control of small coolibah saplings.

II. MATERIALS AND METHODS

Site.—The experiment was conducted in central Queensland at "Wilpeena", 160 km N.N.W. of Rockhampton, on an undulating alluvial plain of Roper Creek about 0·8 km from its junction with the Mackenzie River. Average annual rainfall is 610 mm with summer dominance.

The area contained a dense population of coolibah saplings (up to 1 000/ha) which germinated from seed following floods in 1954 and 1958. Prior to 1954 mature trees of *Eucalyptus tereticornis*, *E. tessellaris* and some *E. microtheca* had been removed by ringbarking.

The soil was a duplex with a relatively shallow (less than 250 mm) sandy loam surface, classified as a Dy 2·43 (Northcote 1965).

Treatments and design.—Treatments of 2 chemicals x 3 concentrations x 3 application methods x 2 application times were arranged in a complete factorial design and replicated three times. Treatment data are given in Table 1. The cut stump application method included control plots where no chemical was applied. Controls were not included for the other two methods.

Plot size was 10 m x 4 m and each plot contained at least 30 saplings, of which at least 10 had a basal diameter in the range 0–25 mm and ten in the range 26–76 mm. Most saplings were of these sizes and the remainder ranged from 77 to 127 mm. Sapling heights varied from 0·6 to 6·0 m.

TABLE 1

CONCENTRATIONS OF PICLORAM AND 2,4,5-T APPLIED PER SAPLING BY THE THREE METHODS OF APPLICATION

Percentage active constituent

Chemical	Method of Application		
	Cut Stump	Stem Injection	Basal Bark Spray
Picloram (*a*) ..	0·05, 0·1, 0·2	0·5, 1·0, 2·0	0·025, 0·05, 0·2
2,4,5-T (*b*) ..	1·0, 2·0, 4·0	4·0, 8·0, 16·0	1·0, 2·0, 4·0

(*a*) Contained in " Tordon 50D " (5% picloram with 20% 2,4-D, both present as the propanolamine salt)—mixed with water.

(*b*) Contained in " Farmco T40 " (40% w/v 2,4,5-T present as butyl esters)—mixed with diesoline.

Application methods.—These were as follows:

Cut stump. The saplings were cut off as close to ground level as possible with an axe, and the butts immediately swabbed with 20–30 ml of chemical applied by a "Rega" knapsack flame thrower fitted with a fine nozzle.

Stem injection. The chemicals were injected with a "Marino" tree injector at 2 ml/injection, made near to ground level at approximately 100 mm intervals. As most saplings had a basal circumference of less than 300 mm they were placed into two classes based on easily measurable basal diameters; those in the 0–25 mm class were given one injection and those in the 26–76 mm class were given two injections.

Basal bark spray. The chemical was applied to the stems with the Rega flame thrower to a height of 0·75 m with wetting to the point of run-off. Volumes used varied from 60 to 80 ml per sapling. Saplings less than 0·75 m high had their foliage as well as their stems sprayed.

All saplings in a plot were treated. Treatments were applied on April 10 and 11 and July 24 and 25, 1967. Progressive counts of early sapling kills were made in October 1967 and January 1968, when saplings with no green foliage were recorded as "dead". The final assessment was made in October 1969, when saplings were recorded as dead if they had no green foliage and the stems had dried out.

III. RESULTS

A summary of treatment mean effects is given in Table 2. At the final assessment picloram/2,4-D gave better kills than 2,4,5-T and there was no difference between the July and the April applications. The cut stump technique gave better kills than stem injection and both were more efficient than the basal bark spray. Overall, picloram/2,4-D produced good kills when applied by cut stump and stem injection techniques while similar mortalities were obtained by 2,4,5-T only when applied to the cut stump.

TABLE 2

MEAN PERCENTAGE KILLS OF COOLIBAH SAPLINGS AFTER TREATMENT ON 10,11.iv.67 AND 24,25.vii.67

Treatment	Assessment Dates		
	16.x.67	21.i.68	16.x.69
Picloram/2,4-D	86	82	80
2,4,5-T	95	73	68
April (iv)	89	74	71
July (vii)	91	82	72
Cut stump	99	88	90
Stem injection	94	87	82
Basal bark spray	77	59	52
Picloram/2,4-D—cut stump	100	88	90
2,4,5-T—cut stump	99	87	90
Picloram/2,4-D—stem injection ..	96	96	92
2,4,5-T—stem injection	91	77	72
Picloram/2,4-D—basal bark spray ..	61	61	60
2,4,5-T—basal bark spray	94	56	43

Figure 1 shows the main treatment effects at the final assessment on the two basal diameter sizes 0–25 mm and 26–76 mm. Because of insufficient numbers larger sapling sizes were excluded from the analysis.

In the cut stump method all concentrations of picloram/2,4-D and 2,4,5-T produced kills of approximately 80% or greater. There was an indication that the chemicals were less effective on the smaller (0–25 mm diam.) saplings. In the control where no chemical was applied most regrowth occurred with the larger saplings. Significantly lower kills were obtained in the control ($P = 0{\cdot}05$) compared with cut stump treatments when chemical was applied.

Similar results were obtained with picloram/2,4-D when applied by stem injection. With 2,4,5-T all kills were less than 80%; while lower kills were obtained on the smaller saplings at the two highest concentrations, the opposite occurred at the lowest concentration.

Less than 80% kills occurred with both chemicals when applied by basal bark spray, except at the highest concentration of picloram/2,4-D. Better kills were obtained on the smaller saplings except at the highest concentration, when there was no difference.

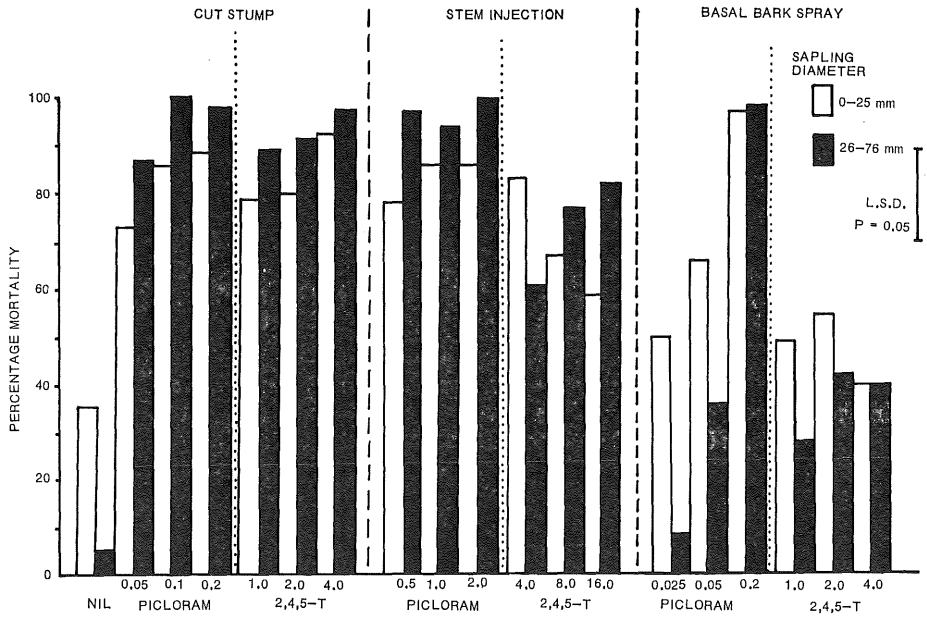

Fig. 1.—Effect of picloram and 2,4,5-T at different concentrations (percentage active ingredient) on coolibah saplings recorded to 16.x.69 and expressed as percentage mortality.

The only results included for the application times are those from where 2,4,5-T was applied by stem injection (Figure 2). The trend was for the April applications to give greater kills on the small saplings except at the 16% concentration, while at the July application the better kills occurred on the large saplings. Other data have been excluded either because there were no treatment differences, such as those incorporating picloram/2,4-D, or if differences did occur poor kills were obtained, such as applying 2,4,5-T by basal bark spray.

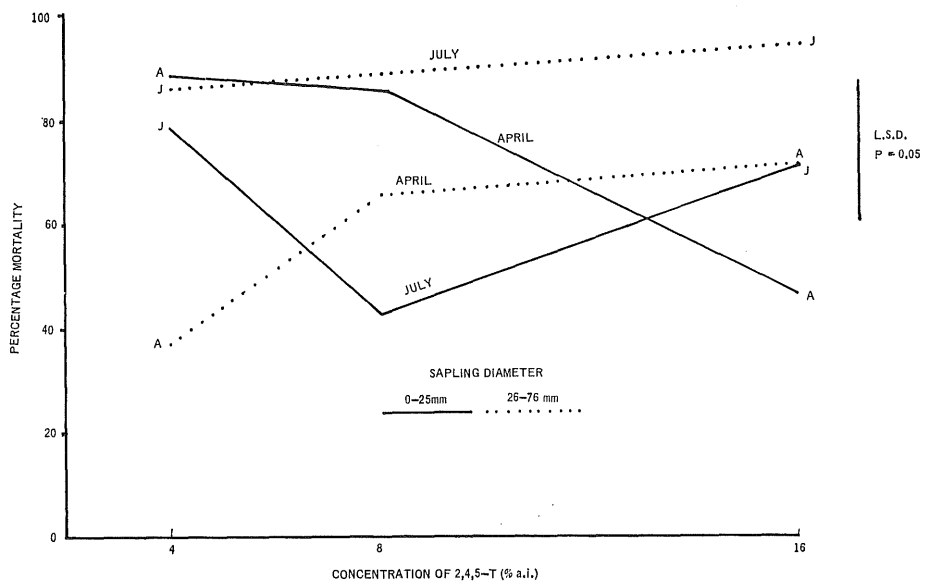

Fig. 2.—Effect of 2,4,5-T applied by stem injection in April and July 1967, recorded in Oct. 1969, on coolibah saplings with basal diameters 0–25 mm and 26–76 mm.

IV. DISCUSSION

As found by Robertson (1966), Robertson and Moore (1972) and Back (1972) on other eucalypt species, picloram/2,4-D proved more effective and reliable than 2,4,5-T.

With the cut stump technique, Back (1972) found that 0·2% concentration of picloram in a preparation of the amine salt of picloram and 2,4,5-T ("Tordon 105"), was consistently more efficient than 0·1% concentration in controlling *Eucalyptus cambageana* saplings. However, in this experiment with coolibah, concentrations as low as 0·05% picloram in the amine salt of picloram and 2,4-D preparation gave kills not significantly smaller than 0·1% and 0·2% concentrations. Also, with 2,4,5-T, the 1·0% concentration on coolibah proved more efficient than the results reported by Back for *E. cambageana* (kills ranged from 23 to 73%), indicating that coolibah may be more susceptible to these chemicals than *E. cambageana* when applied to the cut stump. On the other hand the difference could be solely due to the different contributions of 2,4,5-T and 2,4-D in the preparations with picloram.

For stem injection the commercial recommendation of 1% picloram in the amine salt of picloram and 2,4-D preparation produced good kills with coolibah in this experiment and with other eucalypts in other experiments (Robertson 1966; Robertson and Moore 1972; Back 1972). A concentration of 0·5% picloram also produced good kills in the above experiments. However, weaker concentrations did not give good kills on *E. populnea* when the volume per injection was less than 5 ml and it is not known if the same would occur with coolibah.

Good kills by basal bark spraying with 0·2% concentration of picloram in the amine salt of picloram and 2,4-D preparations were obtained with coolibah in this experiment. This result was unexpected as this was not a conventional commercial treatment. Back (1972) obtained similar results on *E. cambageana*, although the soil needed to be moist. Back also reported some good kills (90%) with 2,4,5-T at 5% concentration, while a slightly lower concentration (4%) was ineffective on coolibah in this experiment. Valid comparisons between the results of Back's experiment and this one are precluded because Back's preparations (both of picloram and of phenoxyacetates) were ester formulations and were applied in a different carrier (oil).

The indications that the smaller saplings were less affected by chemicals applied by the cut stump and stem injection methods, but more affected when applied by a basal bark spray, could be partly due to the efficiency of the various methods. With the cut stump method the smaller saplings often did not cut off as cleanly as the larger saplings and provided a relatively smaller area to absorb the applied chemical. The stem injection method often caused the small saplings to break off and much of the applied chemical was spilt. Why an apparently greater mortality should occur on the smaller saplings by stem injection at the lowest concentration of 2,4,5-T is not known.

With basal bark spraying the better results obtained on the smaller saplings compared with the larger ones could have been due to the fact that the smaller ones had a significant portion of their foliage sprayed as well as their stems. Since overall spraying of young seedlings could be a convenient method of treatment, studies to assess its effectiveness are warranted.

Since completing this experiment two other picloram preparations have been marketed for woody weed control, namely "Tordon 105", containing 5% picloram and 20% 2,4,5-T, and "Tordon 255", containing 10% picloram with 40% 2,4,5-T. Robertson and Moore (1972) and Back (1972) found these chemicals to be as efficient as or more efficient than Tordon 50D in the control of eucalypts and it is probable that similar results could apply to coolibah.

V. ACKNOWLEDGMENTS

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