CHEMICAL CONTROL OF *EUCALYPTUS LARGIFLORENS* SAPLINGS ON GRAZING LANDS

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ABSTRACT

Experiments for the chemical control of Eucalyptus largiflorens *saplings on grazing land were conducted at Thallon, in southern Queensland. The compounds used were amine and butyl 2,4,5-T and formulations of picloram with 2,4-D or 2,4,5-T. Methods included stem injections, stem base sprays and cut-stump sprays. Treatments were applied on at least four occasions from May 1965 to September 1967.*

In stem injection experiments, the picloram compounds applied at 1.0% gave high percentage kills at all application times. Butyl 2,4,5-T and mixed esters of picloram and 2,4,5-T applied in diesel distillate were effective as stem base sprays, with the diesel distillate alone giving variable results. Amine 2,4,5-T and mixtures of picloram with either 2,4-D or 2,4,5-T gave high percentage kills when applied in water as cut-stump treatments.

INTRODUCTION

Regrowth of woody species is an economic and animal husbandry problem on many Australian grazing lands with predominantly summer rainfall. Cleared land may be invaded by seedlings, or regrowth may occur from the bases of trees that have been ringbarked or mechanically damaged. The nature and extent of woody plant regeneration has been discussed by Moore (1968 and 1970) and Moore, Condon and Leigh (1970).

Eucalyptus largiflorens (black box) occurs on grey cracking clays frequently in association with coolibah (*E. microtheca*) with which it is often confused in the sapling stage. *E. largiflorens* flowers from August to November and produces a large number of viable seeds. These may be deposited by receding waters on flood-plains and run-on areas and dense thickets of seedlings are common following good rains.

Like many other eucalypts, *E. largiflorens* can regrow from stumps and lignotubers after mechanical damage. A common way of trying to kill saplings or mature trees is by ringbarking. But ringbarking alone does not usually kill *E. largiflorens;* regrowth generally occurs below the girdle, and shoots may have to be lopped three times or more before the parent tree eventually dies. Arsenical compounds applied in conjunction with frilling have given variable and generally poor results. Thinning mature trees in *Eucalyptus populnea* shrub woodlands by stem injections with compounds containing 4-amino, 3,5,6-trichloropicolinic acid has been reported by Robertson and Moore (1972). The present studies describe effects of stem injections, stem base sprays and cut-stump applications of similar chemicals on saplings of *E. largiflorens.*

METHODS AND RESULTS

Experiments were conducted at 'Bullamon Plains', Thallon in southern Queensland. The soil of the experimental site is a grey cracking clay of pH 6.2. The mean annual rainfall is 475 mm, 70% of which generally falls between October to March.

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Application procedures

E. largiflorens saplings, about 12 years old, 600-750 cm tall and with basal circumferences between 30 and 40 cm, were selected for each experiment. Three methods of application were used, stem injection, cut-stump and basal spray. Stem injections and basal spray were applied on four, and cut-stump treatments on seven occasions.

Stem injection experiments were designed to assess the toxicity of 4-amino, 3,5,6-trichloropicolinic acid (picloram) formulated in a 5% solution as the propylamine salt and marketed in mixtures with 20% 2,4-D as Tordon 50D Weedkiller*, and with 20% 2,4,5-T as Tordon 105 Treekiller*. The experiments examined effects of concentration and season of application. Low volume injections were applied with a Jim Gem Tree Injector†, calibrated to deliver 2 ml per injection. Injections were made at 12.5 cm intervals around the tree base. Cuts were 2.5 cm wide and 10 cm of bark were left undisturbed between cuts. Control trees were cut with the injector blade at the same intervals without injecting carrier or chemical.

In cut-stump experiments comparisons were made between various concentrations of amine 2,4,5-T, Tordon 50D and Tordon 105 in water. Trees were chopped as close to ground level as practicable with downward sloping cuts to leave a V-shaped pocket; the chemical was sprayed on the cut surface of this pocket immediately after cutting. Control trees were felled in the same manner but no chemical or carrier was applied.

In the basal spray eperiments comparisons were made of a range of concentrations of 2,4,5-trichloroacetic acid as the butyl ester (B2,4,5-T) and of 4-amino 3,5,6-trichloropicolinic acid (picloram) formulated in a 10% solution as the iso-octyl ester and marketed in a mixture with the propylene glycol ester of 2,4,5-T as Tordon 255 Brushkiller*. The carrier of the esters was diesel distillate. The stem of each sapling was sprayed to wetness from ground level to a height of 30 cm. If trees had more than one stem, each was treated separately.

Stem Base Injections

Concentrations ranging from 0.125 to 2.0% picloram as Tordon 50D and Tordon 105 were applied in October 1966 and in February, May and September 1967. Ten saplings were treated with each chemical at each application date. Treatments and results are shown in Table 1.

Generally the higher the concentration the greater the percentage kill; dosages in excess of 0.05 g picloram per tree as either Tordon 50D or Tordon 105 achieved kills of 90% or more. An application of 0.03 g picloram as Tordon 105 killed an average of 95% compared with 75% when applied as Tordon 50D, due largely to a poor kill by 50D in October 1966. Trees cut with the injector but without any chemical being applied were not killed.

Cut-Stump Applications

2,4,5-T and Tordon 50D were applied on seven occasions from May 1965 to September 1967. Tordon 105 was included at the last four treatment dates. Twenty-two to thirty stumps were treated with each chemical at each application date. Treatments, times of application and results are given in Table 2.

The Tordon compounds proved to be more consistent and gave higher overall kills than 2,4,5-T. It required 0.5 g of 2,4,5-T per stump to give a kill of 90%, whereas only 0.01 g per stump of picloram as Tordon 50D or Tordon 105 was required to obtain the same percentage kill. Differences between Tordon compounds were small. Trees felled without treatment with chemicals regrew and at the time of the final counts had vigorous shoots 150-180 cm tall.

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* Trade name registered by Dow Chemical (Australia) Ltd.
† Manufactured by Forestry Supply Inc., Jackson, Mississippi, U.S.A.

TABLE 1

Effects of Tordon 50D and Tordon 105 applied by injection to stem bases of saplings of Eucalyptus largiflorens *at different concentrations and application dates.*

Compound	Concentration (%)	Mean volume ml Tree $^{-1}$	Mean active ingredient g Tree^{-1}	Per cent trees dead April 1969				
				Application dates				
				Oct. '66	Feb '67	May '67	Sept. '67	Mean
Tordon 50D	0.125	6.0	0.008 picloram + 0.03 2, 4-D	20	0	10	20	12.5
	0.25	5.6	0.014 picloram + 0.06 2, 4-D	90	50	50	60	62.5
	0.5	5.7	0.029 picloram + 0.12 2, 4-D	50	80	90	80	75.0
	1.0	5.1	0.051 picloram + 0.20 2, 4-D	80	100	100	100	90.0
	2.0	5.0	0.099 picloram + 0.40 2, 4-D	100	100	90	100	97.5
Tordon 105	0.125	5.4	0.007 picloram + 0.03 2, 4, 5-T	20	0	10	20	12.5
	0.25	5.4	0.014 picloram + 0.06 2, 4, 5-T	80	40	60	50	57.5
	0.5	5.3	0.029 picloram + 0.12 2, 4, 5-T	100	80	100	100	95.0
	1.0	5.6	0.056 picloram + 0.22 2, 4, 5-T	100	90	100	90	95.0
	2.0	5.9	0.118 picloram + 0.47 2, 4, 5-T	100	100	100	80	95.0

TABLE 2

Effects of amine 2,4,5-T, Tordon 50D and Tordon 105 applied to cut-stumps of Eucalyptus largiflorens.

Compound	Concentration (%)	Mean volume ml Tree^{-1}	Mean active ingredient g Tree^{-1}	Per cent trees dead April 1969							
				Application dates							
				May '65	Aug. '65	Feb. '66	Oct. '66	Feb. '67	May '67	Sept. '67	Mean
A 2,4,5-T	1	21.9	0.22 2,4,5-T	92	92	48	46	100	85	67	76
	2	25.1	0.50 2,4,5-T	100	92	84	77	100	100	77	90
	4	27.8	1.11 2,4,5-T	100	100	84	77	100	93	87	92
Tordon 50D	0.05	26.0	0.01 picloram + 0 04 2,4-D	96	80	76	92	100	96	100	91
	0.1	25.9	0.03 picloram + 0.12 2,4-D	100	100	92	100	100	100	100	99
	0.2	25.6	0.05 picloram + 0.20 2,4-D	100	100	96	100	100	96	100	99
Tordon 105	0.05	28.3	0.01 picloram + 0.04 2,4,5-T				100	92	100	97	97
	0.1	29.5	0.03 picloram + 0.12 2,4,5-T				100	100	100	100	100
	0.2	30.6	0.06 picloram + 0.24 2,4,5-T				100	100	100	97	99

TABLE 3

Effect of season of application and concentration of butyl 2,4,5-T and Tordon 255 applied in diesel distillate to stem bases of Eucalyptus largiflorens.

Compound	Concentration (%)	Mean volume ml Tree^{-1}	Mean active ingredient g Tree^{-1}	Per cent trees dead April 1969				
				Application dates				
				Oct. '66	Feb. '67	May '67	Sept. '67	Mean
Tordon	0.05	85.5	0.04 picloram + 0.17 2,4,5-T	100	97	100	100	99
	0.075	79.5	0.06 picloram + 0.24 2,4,5-T	100	100	100	100	100
	0.10	84.4	0.08 picloram + 0.34 2,4,5-T	100	100	100	100	100
	0.20	78.9	0.16 picloram + 0.63 2,4,5-T	100	100	100	100	100
	0.40	85.2	0.34 picloram + 1.36 2,4,5-T	100	100	100	100	100
B 2,4,5-T	0.4	80.4	0.32 2,4,5-T	100	75	94	97	92
	0.8	74.2	0.60 2,4,5-T	90	93	91	100	94
	1.6	81.4	1.30 2,4,5-T	92	93	100	100	96
	3.2	77.5	2.48 2,4,5-T	100	100	97	97	98
Diesel distillate		81.5		79	58	68	90	74

Stem Base Sprays

Twenty-two to thirty-four saplings were treated with each of two compounds on four occasions from October 1966 to September 1967. The treatments applied and results obtained are shown in Table 3.

Both compounds gave high percentage kills at each application time. The lowest dosage, 0.04 g of picloram (plus 0.16 g 2,4,5-T) per tree, was sufficient to kill every tree except in February 1967, when 97% were killed. It required about 0.60 g of B 2,4,5-T per tree to kill 90% or more at each application. Diesel distillate alone killed between 58 and 90% of treated trees.

DISCUSSION

The results indicate that saplings of *E. largiflorens* can be killed by any of the three methods tested and that both 2,4,5-T and Tordon formulations are satisfactory for use in cut-stump or stem base spray applications. At low and marginal concentrations of chemicals there were differences among times of application but these were not consistent. No general relationship could be established between effectiveness of treatments and time of the year at which they were applied.

If the stem injection method is used, kills of 80% or more at any application time can be achieved by injecting 2 ml of 1% picloram as either Tordon 50D or Tordon 105 every 12.5 cm of basal circumference. The results were similar to those obtained by Robertson and Moore (1972) on mature trees of *Eucalyptus populnea.*

High percentage kills were obtained from both 2,4,5-T and Tordon compounds applied to cut-stumps, but much higher application rates were needed of 2,4,5-T alone than for the Tordon formulations. When using this application method it is essential for the spray material to be applied to the eposed cut surface of the stump as soon as possible after felling.

Butyl 2,4,5-T and Tordon 255 gave excellent control at all application times when applied as stem base sprays, with the latter compound requiring less active ingredient per sapling.

As all three application methods examined gave effective control of *Eucalyptus largiflorens* saplings, the choice of the most appropriate method to use would depend largely on the size of the saplings to be treated, costs of the chemicals, labour and application equipment available.

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