THINNING *EUCALYPTUS POPULNEA* WOODLANDS BY INJECTING TREES WITH CHEMICALS

J. A. ROBERTSON* AND R. M. MOORE*

ABSTRACT

Injection of trees with chemicals was investigated as an alternative to ringbarking for reducing tree densities and promoting growth of grasses and other herbs in shrub woodlands.

Mature trees of Eucalyptus populnea (*poplar box*) *70-100 cm in circumference at the base were killed by injection between bark and wood with 2,4,5-T, or mixtures of picloram with* 2, 4-*D or* 2, 4, 5-*T. Amine* 2, 4, 5-*T was as effective as the butyl ester in the few comparisons made.*

Spacing of injections, concentrations, and volumes injected appeared to be significant only as determinants of the amount of chemical applied per tree.

Injections at waist height (1 m) were as effective as at tree base when chemicals were applied in equal amounts and by the same or equivalent methods.

Tree injectors with straight or concave cutting blades 2.5-5.0 cm wide, gave better results than the standard axe with a 13 cm blade. An axe blade reduced in width to 5 cm and modified to make a cut similar to that of a tree injector was effective for injecting at waist height and gave results similar to those obtained with a tree injector at tree base.

A basal application of 2 ml of 1% picloram as Tordon 50D or 105 made with a tree injector at 13 cm intervals consistently killed more than 90% of poplar box trees treated. At this dosage level results were equally good at all times of the year.

INTRODUCTION

The desirability of reducing densities of trees and shrubs and of controlling their regeneration on grazing lands have been discussed by Moore (1972). One of the most extensively distributed trees of semi-arid grazing lands is *Eucalyptus populnea* variously known as poplar, bimble or round-leaved box, a dominant species in shrub woodlands from latitude 23°S to 34°S in eastern Australia (Moore, Condon and Leigh 1970; Moore and Perry 1970; Moore 1972). It commonly exceeds 250 individuals per ha and at such densities grass production is low. Poplar box is difficult to kill and only sporadic success has been achieved in thinning woodlands of this species by ringbarking and repeated removal of the shoots that usually develop subsequently.

Kills by injection at the junction of bark and sapwood with butyl 2,4,5-trichlorophenoxyacetic acid (butyl 2,4,5-T) have been reported by Robertson (1966). The present paper discusses experiments 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 a mixture with 2,4-D as Tordon 50D†, and with 2,4,5-T as Tordon 105†. The experiments include comparisons with 2,4,5-T and examine effects of, concentration, volume of application, season of application, height of application, type of injector, and spacing of injections.

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*Woodland Ecology Unit, C.S.I.R.O., Cunningham Laboratory, Mill Road, St. Lucia, Queensland, 4067.

†Registered trade names of the Dow Chemical Company.

EXPERIMENTAL METHODS

The experiments were in southern Queensland at approximately 28°S latitude and all but one were conducted at the "Wycanna" Woodland Experiment Centre, 28 miles north-west of Talwood. The soils of the shrub woodlands at Wycanna range from solonized red-brown earths to solodics. The rainfall recorded in the past 40 years is 500 mm, 70% of which fell between October and March. During the period treatments were applied (1964-70) the annual rainfall varied from 324 to 580 mm; drought conditions prevailed except during the spring of 1969 and summer of 1970. Only single-stemmed trees between 70 and 100 cm circumference at the base were used in these studies.

The implement most commonly used for making cuts in which chemicals are applied to trees is the ringbarking axe which has a convex blade 13 cm wide. The chemical is applied to the cut from a plastic bottle or syringe. A recently available alternative to the axe is the tree injector. This implement carries the chemical in solution or emulsion in a cylinder to which is attached a chisel-shaped or concave cutting blade 2.5-5 cm wide.

In practice height and method of application are usually confounded. The tree-injector is designed for application at tree base; the axe is only conveniently used at ringbarking height (approximately 1 m from the ground). The two implements differ in both height of application and geometry of cut.

Applications of Tordon by axe at tree base were compared with applications by axe at waist height. The axe was then compared with the tree-injector using both a normal 13 cm blade and one modified to make a cut similar to that of a tree-injector.

Amounts of chemicals applied per tree were varied by concentration, volume per injection, and by spacing or number of injection points. Where appropriate both Tordon and 2,4,5-T were diluted with water. Concentrations quoted for Tordon refer to its picloram content.

High volume injections were made at tree bases with a Reuel Little Tree Injector.* This instrument cannot be calibrated to deliver a fixed dose but the cut it makes in the bark of poplar box holds approximately 9 ml. The injector has a 5 cm (2 in.) cutting bit so that injections at 8, 13 and 18 cm (3, 5 and 7 in.) centres leave respectively 2.5, 8 and 13 cm strips of undisturbed bark between the edges of adjacent cuts. The fluid in the injector was measured before and after each treatment to determine mean volumes applied per tree.

Low volumes were applied with a Jim Gem Tree Injector** calibrated to deliver set volumes from 0.18 to 3.60 ml per injection. Undiluted butyl 2,4,5-T (40%) and undiluted Tordon (5% picloram) at 0.45, 0.90 and 1.80 ml per injection applied the same amounts of active ingredient as 9 ml of 2, 4 and 8% butyl 2,4,5-T and 0.25 and 1% picloram respectively. The Jim Gem Tree Injector has a cutting bit approximately 2.5 cm wide and leaves strips of undisturbed bark 5.5, 10.5 and 15.5 cm wide between injections at 8, 13 and 18 cm spacings respectively.

Controls varied according to methods of applying chemicals. These are described for individual experiments but in most cases trees were injected dry, that is, speared or cut without applying a chemical. The heights of the cuts and the intervals between them were similar to those of the chemical treatments. In one experiment ringbarking 1 m above ground level without applying chemicals was compared with chemical injection.

Trees were considered dead if following death of leaves and twigs there was no resprouting at least 12 months after treatment.

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*Reuel Little Tree Injector Company, Oklahoma, U.S.A.
**Forestry Supplies Inc., Jackson, Mississippi, U.S.A.

TABLE 1

Effects of 2,4,5-T and picloram applied by basal stem injection at different concentrations, volumes, and spacings to mature trees of Eucalyptus populnea *(average girth size at base 93 cm). Means of 2 to 4 application times. 10 trees/treatment*

Chemical and formulation	Concentration per cent	Injection spacing cm	Volume ml/injection	Mean active ingredient/tree (g)	Trees dead Dec. '68	Per cent mean kills (all spacings)
Butyl 2,4,5-T	2	8	8.5	1.90	38/40	83
		13	8.2	1.15	35/40	
		18	9.4	1.07	27/40	
	4	8	8.3	3.68	40/40	97
		13	8.2	2.37	39/40	
		18	9.3	2.05	37/40	
	8	8	7.9	7.51	40/40	97
		13	7.7	4.49	40/40	
		18	8.4	3.61	36/40	
	40	8	0.45	2.40	38/40	87
		13	0.45	1.40	34/40	
		18	0.45	0.99	32/40	
	40	8	0.90	4.72	40/40	87
		13	0.90	2.73	35/40	
		18	0.90	1.96	29/40	
	40	8	1.80	9.62	38/40	94
		13	1.80	5.23	38/40	
		18	1.80	3.91	37/40	
Amine 2,4,5-T	2.0	8	8.9	2.18	29/30	92
		13	8.5	1.33	27/30	
		18	9.3	1.10	27/30	
	4.0	8	8.7	4.08	29/30	92
		13	9.1	2.44	29/30	
		18	9.2	1.70	25/30	
	8.0	8	8.5	7.86	30/30	93
		13	8.9	4.92	29/30	
		18	9.1	4.19	25/30	
Picloram as Tordon 50D	0.05	8	8.9	0.06	16/20	77
		13	8.8	0.03	14/20	
		18	9.0	0.03	16/20	
	0.1	8	8.3	0.10	19/20	93
		13	8.2	0.06	19/20	
		18	9.5	0.06	18/20	
	0.5	8	7.8	0.44	38/40	94
		13	7.5	0.25	39/40	
		18	8.3	0.23	36/40	
	1.0	8	7.9	0.89	40/40	100
		13	7.1	0.53	40/40	
		18	8.1	0.47	40/40	
	2.0	8	7.8	1.86	20/20	100
		13	7.4	1.10	20/20	
		18	8.2	0.83	20/20	
Picloram as Tordon 50D	5.0	8	0.23	0.14	28/30	87
		13	0.23	0 08	24/30	
		18	0.23	0 06	26/30	
	5.0	8	0.45	0 29	30/30	91
		13	0.45	0.17	27/30	
		18	0.45	0.13	25/30	
	5.0	8	0.90	0.60	29/30	97
		13	0.90	0.35	29/30	
		18	0.90	0.25	29/30	
	5.0	8	1.80	1.26	20/20	100
		13	1.80	0.72	20/20	
		18	1.80	0.52	20/20	
Control (dry injections)		8	0.0	0.0	1/40	1
		13	0.0	0.0	0/40	
		18	0.0	0.0	0/40	

Experimental designs were factorial without additional spatial replication (Cornish 1936) or randomized blocks with 2 to 4 replicates. Where analyses of variance were considered appropriate, controls were omitted from the analyses and a square root transformation was used on the other values.

EXPERIMENTS AND RESULTS

Experiment (i)

The toxicities of Tordon 50D (5% picloram and 20% 2,4-D), and 2,4,5-T applied in both high and low volumes, and at different spacings around the tree trunk were compared.

The main treatments were applied in December, 1964, April, August and October, 1965. Others applied on 2 or 3 of these occasions are shown in the tables. The period during which treatments were applied was dry; the total rainfall for 1965 was only 324 mm.

Initial concentrations of picloram subsequently appeared higher than necessary and dosage ranges were reduced for the last two application times. Treatments and results are shown in Tables 1 and 2.

Both Tordon 50D and 2,4,5-T killed poplar box trees, but Tordon appeared to be the more toxic. Except at a very low concentration (0.05% picloram) and at very low volumes (0.23 ml per injection) Tordon killed more than 90% of the trees to which it was applied and statistical tests were not applied. Rating it on its picloram content alone Tordon killed more than 90% of trees treated at a dosage of about 0.1 g of active ingredient per metres of basal circumference. To obtain the same kill about 2.0 g, 2,4,5-trichlorophenoxyacetic acid per metre were required.

Amine 2,4,5-T appeared to be at least as toxic as the butyl ester on the three occasions it was used.

Applications at close spacings tended to be more effective than those at wide spacings but only when concentrations or injection volumes, particularly of 2,4,5-T, were low.

TABLE 2

Eucalyptus populnea. *Effects of 2,4,5-T and of picloram as Tordon 50D applied in approximately equivalent amounts in high and low volumes. Means of three injection spacings, and three concentrations or volumes of 2,4,5-T and two of picloram*

Treatment and (concentration range)	Volumes of injection (ml) and (ranges)	Mean active ingredient g per m. circumference	Trees dead Dec., '68 following applications in				Means all times
			Dec. '64	Apr. '65	Aug. '65	Oct. '65	
B,2,4,5-T (2–8%)	8.4 (6.8–10.8)	3.3	92	89	94	91	91
B,2,4,5-T (40%)	1.05 (0.45–1.80)	3.9	94	89	97	79	90
Picloram as Tordon 50D (0.5–1.0%)	7.8 (6.2–9.1)	0.5	97	100	100	92	97
Picloram as Tordon 50D (5%)	1.35 (0.90–1.80)	0.6	98	100	100	92	97
Means			95	94	98	88	94

Time of application affected results only in the case of 40% butyl, 2,4,5-T (5 per cent level), and then only at injection volumes of less than 1 ml and injection spacings greater than 5 cm.

Experiment (ii)

In this experiment the utility of the standard axe for applying Tordon was tested. Tordon 50D was applied at three concentrations and two volumes in high and low cuts spaced 13 cm from centre to centre. The chemical was applied between bark and wood with a vaccinator-syringe immediately the cuts were made.

Treatments were applied on four occasions, August and October 1965 and January and April 1966. On each occasion the controls were axe cuts high and low without Tordon. Rainfall in 1966 totalled 441 mm.

The design was a 3 × 2 × 2 × 4 factorial. Treatments and results are shown in Tables 3 and 4.

TABLE 3

Eucalyptus populnea. *Effects of height of application, volume and concentration of picloram as Tordon 50D applied by vaccinator-syringe in axe cuts spaced 13 cm from centre to centre. Means of four application times*

Concentrations Picloram per cent as Tordon 50D	Volumes ml/injection	Heights of injection	Mean active ingredient/ tree (g)	Trees dead Dec. '68	Per cent mean kills	Means
0.1	1	LOW	0.006	3/40	7.5	3.7
		HIGH	0.005	0/40	0.0	
	5	LOW	0.027	29/40	72.5	67.5
		HIGH	0.023	25/40	62.5	
0.5	1	LOW	0.030	26/40	65.0	53.7
		HIGH	0.022	17/40	42.5	
	5	LOW	0.145	39/40	97.5	88.7
		HIGH	0.115	32/40	80.0	
1.0	1	LOW	0.060	33/40	82.5	70.0
		HIGH	0.046	23/40	57.5	
	5	LOW	0.280	40/40	100.0	98.7
		HIGH	0.223	39/40	97.5	
Controls (dry injection)		LOW	0.00	0/40	0.0	0.0
		HIGH	0.00	0/40	0.0	

Significance levels (omitting 0.1% treatment):
Volumes $P < .01$.
Concentrations N.S.
Heights of application $P < .05$.

Effect of concentration varied with volume of injection and height of application. Kills of more than 90% were obtained only in 5 ml dosages and at concentrations of 0.5 and 1%.

The average circumference of poplar box trees in this experiment was 23 cm less at 1 m from the ground than at tree base. Trees treated high at 13 cm spacings averaged 1.8 fewer injections and 0.019 g less active ingredient than those treated low. Omitting the 0.1% concentration treatment which was virtually without effect at 1 ml, the

difference between actual dosages at high and low positions was 0.028 g of active ingredient per tree and differences in favour of applications at tree base were significant at $P < .05$.

TABLE 4

Eucalyptus populnea. *Effect of season of application and height of injection of Tordon 50D. Injection by axe and syringe. Means of two concentrations and two volumes of injection (40 trees)*

Heights of injection	Mean active ingredient/ tree (g)	Per cent kills Dec. 1968 from applications in:— Aug. 1965	Oct. 1965	Jan. 1966	Apr. 1966	Means
Low (base)	.129	95	85	85	80	86
High (1 m from base)	.101	85	73	50	70	69
Means		90	79	67	75	78

Significance levels:
Application times N.S.
Heights of application $P < .05$.

Times of application did not affect results of applications to tree base significantlr but there was a suggestion that high applications were less effective in the warmey than in the colder months of the year.

Experiment (iii)

In this experiment, a $2 \times 2 \times 2$ factorial with 2 replications, a standard axe was compared with a tree-injector. Comparisons were made also of two amounts of Tordon 50D, applied at tree base and 1 m from the ground, this time taking account of the smaller circumference of the trunk 1 m above ground level. The number of injections both at ground level and at height 1 m were determined by the circumference at ground level where the injection intervals were 18 cm. In contrast to the previous experiment trees of equal base circumference received the same amount of chemical irrespective of height of application. The mean circumference at the base of trees used in the experiment was 103 cm (range 108.5-94.5 cm); the mean number of injections was 5.8, the same for both low and high treatments.

Treatments were applied in September 1966 and final counts were made in November 1968. Controls were axe and injector cuts in high and low positions without chemical. Rainfall recorded in 1967 and 1968 was 324 mm and 380 mm respectively.

Treatments and results are shown in Table 5.

When equal amounts of picloram as Tordon 50D were applied there was no significant difference between high and low applications with either axe or tree-injector. The tree-injector was superior to the axe particularly at the lower dosage level.

Experiment (iv)

This was a comparison of Tordon 50D and Tordon 105 at each of three concentrations. Injections were made at tree base with a tree-injector, and at 1 m from the base with an axe, the blades of which had been ground to make a cut similar to that of a tree-injector. The volume injected was 2 ml and the low injections were spaced approximately 13 cm from centre to centre. The number of injections for the high treatments were determined by the circumference at the tree base. Controls were dry cuts low with a tree-injector and dry cuts high with the modified-axe; the number at both heights being determined by the circumference at the base. Other treatments were collar and frill ringbarking 100 cm from the ground without applying chemicals.

TABLE 5

Eucalyptus populnea. *Comparison of two dosages of Tordon 50D applied September 1966 at 18 cm spacings in high and low positions by tree-injector and axe. Means of two replications*

Method of application	Height of application	Mean active ingredient/ tree (g)	Trees dead Nov. '68	Means
INJECTOR	LOW	0.06 (= 1 ml 1%)	20/24	90
	HIGH		23/24	
AXE	LOW	0.06 (= 1 ml 1%)	19/24	75
	HIGH		17/24	
INJECTOR	LOW	0.12 (= 1 ml 2%)	24/24	94
	HIGH		21/24	
AXE	LOW	0.12 (= 1 ml 2%)	21/24	87
	HIGH		21/24	
MEANS	INJECTOR		88/96	92
	AXE		78/96	81
MEANS	LOW		84/96	87
	HIGH		82/96	85
INJECTOR CUTS (No chemical)	LOW	0.00	0/24	0
	HIGH		0/24	
AXE CUTS (No chemical)	LOW	0.00	0/24	0
	HIGH		0/24	

Significance levels:
Height of application N.S.
Method of application $P < .05$.
Amount of chemical $P < .01$.

The experiment, a $2 \times 3 \times 2 \times 4$ factorial with 2 replications, was begun in March 1969 and repeated in June, September, 1969 and January 1970. Good rains fell in the spring of 1969 and the rainfall for the year was 580 mm. Details of the treatments and counts of dead trees in September 1971 are given in Tables 6 and 7.

The lowest dose in this experiment was in the range .06-.08 g picloram per tree and all chemical treatments gave high percentage kills. Differences due to concentrations, seasons of application, chemicals and methods of application were small and statistical tests were not applied.

Experiment (v)

The effects of injecting Tordon on *E. populnea* when soils are water-logged at the time of treatment were determined during and subsequent to a wet October-November in 1969. From October 1969 different groups of 60 trees were injected each month except May, until September 1970. Injections were made at 13 cm spacings at tree

TABLE 6

Eucalyptus populnea. *Comparison of equivalent amounts of picloram as Tordon 50D and Tordon 105 applied at tree base (low) by a tree-injector (T.I.) and at 1 m per base (high) by a modified (5 cm) axe (M.A.). Applications at 13 cm spacings in three concentrations and on four occasions. Means of two replicates (30 trees)*

Per cent picloram	Height and method of injection	Percentage mean kill (Sept. '71)				Means
		Mar. '69	Jun. '69	Sept. '69	Jan. '70	
0.5	low (T.I.)	80.7	100.0	100.0	96.6	94.3
0.5	high (M.A.)	76.6	86.7	93.3	90.0	86.7
1.0	low (T.I.)	96.7	100.0	96.6	96.6	97.5
1.0	high (M.A.)	86.7	100.0	100.0	100.0	96.7
2.0	low (T.I.)	100.0	100.0	100.0	100.0	100.0
2.0	high (M.A.)	100.0	100.0	100.0	100.0	100.0
Means 50D		90.1	97.8	98.3	97.2	95.9
0.5	low (T.I.)	100.0	100.0	100.0	96.6	99.2
0.5	high (M.A.)	90.0	100.0	96.6	86.6	93.3
1.0	low (T.I.)	100.0	100.0	100.0	100.0	100.0
1.0	high (M.A.)	96.7	93.3	100.0	93.3	95.8
2.0	low (T.I.)	100.0	100.0	100.0	100.0	100.0
2.0	high (M.A.)	86.7	100.0	100.0	100.0	96.7
Means 105		95.6	98.9	99.4	96.1	97.5
General means		92.9	98.4	98.9	96.7	96.7
Control-injection cuts	low	0	0	0	0	0
Ringbarked-frill	high	50.0	20.0	40.0	70.0	45.0
Ringbarked-collar	high	40.0	6.0	16.6	73.3	34.0

TABLE 7

Eucalyptus populnea. *Comparison of three concentrations of picloram applied at base of tree (low) with tree injector (T.I.) or 1 m from ground (high) with a modified-axe (M.A.). Means of two replicates two formulations and four times of applications (240 trees)*

Per cent picloram	Percentage mean kills (Sept. 1971) Low Injection (T.I.)	High Injection (M.A.)	Means
0.5	96.8	90.0	93.4
1.0	98.8	95.2	97.0
2.0	100.0	98.4	99.2
Means	98.5	94.5	96.5

base with a tree injector applying 2 ml of 1% picloram as Tordon 50D. The results and the rainfall received during the period of the experiment are shown in Table 8.

Month of application and rainfall during the periods immediately before and after treatment were obviously without effect; kills of more than 90% were achieved on all occasions.

Experiment (vi)

To determine how soon after injection trees lose capacity to resprout when apical dominance is removed 560 trees were injected at 13 cm spacings with 2 ml of 1% Tordon 50D per injection in January 1968. At one, two, four, eight, sixteen, thirty-two and sixty-four weeks after injection ten single-stemmed trees in each of four replicates, were felled by sawing through the trunk at approximately 1 m from the

TABLE 8

Eucalyptus populnea. *Effect of rainfall during application on effect of Tordon 50D. 2 ml of 1 per cent picloram applied basally at 13 cm spacings*

Injected	Rainfall mm	Trees killed Sept. '71
October '69	171	59/60
November '69	107	55/60
December '69	14	58/60
January '70	67	60/66
February '70	24	60/60
March '70	8	60/60
April '70	30	60/60
May '70 (Not applied)	32	—
June '70	7	59/60
July '70	0	60/60
August '70	15	60/60
September '70	130	60/60

TABLE 9

Eucalyptus populnea. *Effect of interval between injection with picloram as Tordon 50D and felling on capacity to resprout. Means of 10 trees per treatment and four replicates*

Weeks between injection on Jan. 1968 and felling	Per cent resprouting at September 1970		
	Injected, felled	Not-injected, felled	Injected, not felled
1	12.5	100.0	
2	5.0	95.0	
4	0.0	97.5	
8	2.5	97.5	
16	2.5	97.5	
32	0.0	100.0	
64	2.5	97.5	
Control	—	—	1.8

base. At the same times 10 untreated trees of similar dimensions (mean basal circumference 55 cm) were felled to serve as controls. As a further control, trees were injected in January 1968 and not felled. The average percentages of treated and untreated trees that resprouted are shown in Table 9.

The inhibiting effect of Tordon on resprouting after removal of apical dominance is apparent even 1 week after injection. In contrast most untreated trees resprouted from stumps when felled.

DISCUSSION

The results of the several experiments indicate that Tordon 50D, Tordon 105, butyl 2,4,5-T and amine 2,4,5-T applied in water between bark and sapwood will kill mature single-stemmed poplar box trees. At the dosages tested Tordon 50D, containing 2,4-D was as effective as Tordon 105 which contains 20% 2,4,5-T (Table 7). Approximately 0.15 g or more of picloram per metre of basal circumference applied in Tordon 50D consistently gave percentage kills greater than 90. Dosages of this magnitude can be given conveniently by a tree-injector at tree base or a modified-axe at waist height, applying 2 ml of 1% picloram every 13 cm of basal circumference.

Within the ranges used in our experiments volume of injection, concentration of chemical and spacing of injections (number per unit circumference) appeared to be of significance mainly in determining the amount of chemical applied. High concentra-

tions compensated for low volumes, high volumes for low concentrations and close spacings for low amounts per injection (Tables 1, 2 and 3). Except for a lesser kill by low in comparison with high volumes of 2,4,5-T on one occasion (Table 2) there was no evidence to support the contention of Kimber (1967) that effectiveness of 2,4,5-T increased with dilution. In practice losses of chemicals from injection cuts and by absorption on dry bark might become critical at high concentrations and low volumes.

Standard axe and tree injector were compared in experiment (iii). In this experiment height of application was not confounded with dosage as in experiment (ii) and the axe proved inferior (Table 6). Height of application was not critical when dosage of chemical and method of injection were similar for both positions (Tables 5, 6). At 13 cm spacings cuts with a standard axe are continuous but because of the convex shape of the blade the bark is not completely severed to the sapwood except at the centre of the cut. This means that some of the chemical may be absorbed on dry bark and the dose effectively reduced. Evidence of this may be deduced from Table 5; differences between axe and injector were less at high than at low dosage levels.

Time of application generally did not affect results and the indications are that Tordon will kill poplar box at any time of the year (Tables 2, 4, 6), and in wet (Table 8) as well as in dry conditions (Tables 2, 4, 6, 8). There were suggestions from the data that time of application may possibly be of importance when dosage levels are marginal and that applications in the winter may be more effective than at other times of the year (Tables 2, 4, 6). On the other hand in the few comparisons made (Table 6) collar and frill ringbarking gave best results in summer (72% kill) and autumn (45% kill), and poorest in winter and spring (less than 20% kill).

The inhibiting effect of Tordon on resprouting after removal of apical dominance by felling is apparent even 1 week after injection. In contrast most untreated trees resprouted from stumps when felled (Tables 9). The results suggest that treating trees with Tordon even a few weeks before felling for crops and pastures, would effectively prevent tree regrowth.

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