A COMPARISON OF 2,4,5-T AND PICLORAM FOR GORSE CONTROL

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Summary

Gorse (*Ulex europaeus*) control by picloram both with and without added 2,4,5-T was studied in two areas of Wellington and Otago. Picloram alone gave poor results but in the Wellington area the addition of picloram to 2,4,5-T reduced the amount of regrowth over a 1½ to 2 year period. However, this was only an advantage where a high level of kill was not achieved within six to ten months of application. Picloram efficiency was not improved by an increase in volume of application from 250 to 1,000 gal per acre.

INTRODUCTION

INTRODUCED to New Zealand in 1963, picloram has shown some activity against gorse (*Ulex europaeus*), one of the most aggressive scrub weeds in New Zealand. Foreman (1964) reported that the response to picloram was greater than that to 2,4,5-T ester, while the response to a picloram/2,4,5-T amine mixture was even better.

Moffat (1965) and Leonard (1965) reported superior results with picloram and picloram/2,4,5-T mixtures; Leonard also noted that January application was inferior to applications made in October, November, December, February or March. On the other hand, Patterson (1964, 1965) concluded that picloram was inferior to 2,4,5-T ester.

This paper reports results from Wellington and Otago Department of Agriculture trials that have been mostly concluded in 1967.

MATERIALS AND METHODS

A randomized block layout of 3 to 5 replicates was adopted for all trials.

WELLINGTON

Treatments were applied by mist-blower at half throttle openings, thus giving a coarse droplet high volume spray varying from 175 to 360 gal/acre according to the trial site. The majority of gorse was in the vegetative stage when sprayed and was about 3 to 4 ft in height.

OTAGO

Treatments were applied by mist-blower at full throttle openings, giving a medium to fine droplet spray in the 1964 trials where volume was 120 gal/acre. Volume in the 1965 trial was 900 gal/acre through a spray gun giving medium to coarse droplet sizes. Trial Y compared mist and spray at volumes from 250 to 1,000 gal/acre. In a small technique trial (Z) a preliminary attempt was made to evaluate the activity of picloram through root or foliage.

TABLE 1: FINAL % KILL OF GORSE—WELLINGTON

<i>Trial No.</i>	<i>A</i>		<i>B</i>		<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>
<i>Month sprayed, 1965</i>	<i>Apr.</i>	<i>Oct.</i>	<i>Nov.</i>	<i>Nov.</i>	<i>Dec.</i>	<i>Apr.</i>	<i>Dec.</i>	
<i>Time elapsed (mon.)</i>	23	17	16	16	15	9	9	
<i>Treatment (lb)</i>								
BE-2,4,5-T 2		12			40		0*	90
BE-2,4,5-T 4		40	43	57	78	67	83	97
BE-2,4,5-T 8						99		
BE-2,4,5-T 2 + picloram (K salt) ¾	90				86	97	60	
Amine 2,4,5-T 2 + picloram (amine) ¾		66	37	77	94	63	70	100
Picloram (K salt) ¾					13	77		
BE-2,4,5-T 2 + dicamba 4		70					57	100
Dicamba 4					20			43
Dicamba 8								95

*Heavy rain immediately after application reduced efficiency.

All trials were applied to gorse in the vegetative stage during periods of active growth.

Treatments were inspected at intervals and an estimate was made of the amount of dead foliage, twigs and wood, as a percentage of total cover.

RESULTS

WELLINGTON

Table 1 shows treatments applied in lb a.i./acre in each trial together with the kill (as a percentage of total cover) at the final inspection.

Butoxy ethanol ester of 2,4,5-T performed well in Trials C and F even at the low dose rate of 2 lb but in Trial F both the high percentage kill from 2 lb of 2,4,5-T and high values from other treatments would no doubt have been considerably lower if the trial had run for a further 9 months. However, even at 4 lb, there was a pronounced tendency for 2,4,5-T to decline in percentage kill once the peak at 9 to 12 months after application had passed.

Picloram/2,4,5-T mixtures were initially slower in action than 2,4,5-T alone, although they reached their peak at about the same time (9 to 12 months). The tank mix of picloram salt and butoxy ethanol ester of 2,4,5-T was slightly better than the proprietary blend of picloram and 2,4,5-T amines, and both mixtures appeared to reduce the amount of regrowth 23 months after spraying. An estimate of the reduction of regrowth after the period of peak kill is shown in Fig. 1 for the main treatments for a period of 23 months after application. Both picloram mixtures were superior in this respect to 2,4,5-T.

Very limited comparative data are available on the optimum times of application of 2,4,5-T and picloram/2,4,5-T. Trial B indicated that late November application was more effective than a late October application of picloram/2,4,5-T amines, but had little effect on the efficiency of 2,4,5-T ester.

Fig. 1: Percentage gorse kill during two-year period after spraying. (Mean of main Wellington treatments only.)

OTAGO

Table 2 shows the treatments applied, together with the percentage kill at the final inspection.

Although 4 lb butyl ester of 2,4,5-T was efficient in all trials, up to 3 lb picloram (K salt) was necessary to achieve similar results in one trial, while 2 lb picloram salt was invariably less efficient.

The addition of 0.25 lb picloram salt as an activator to butyl ester of 2,4,5-T was a failure, and may even have reduced its efficiency. Two years after spraying (in Trial U) there was little effect remaining from 1 gal of a proprietary mixture which contained 2 lb 2,4,5-T + 0.75 lb picloram as amine salts; while a 2 gal dosage was considerably better, it was still poorer than butyl ester of 2,4,5-T.

There was little indication in these Otago trials that picloram reduced the amount of regrowth after the peak period of kill had passed (6 months in this series): this was probably because initial percentage kill from picloram was so poor.

In Trial Y, picloram (K salt) 2 lb and butyl ester of 2,4,5-T 5.4 lb were evaluated with mist-blower at 250 and 500 gal/acre, and spray gun at 500 and 1,000 gal/acre. Percentage kill at 6, 12 and 24 months is presented in Table 3.

Although there was a trend towards more efficiency with picloram at the higher volume, there was no real difference between the treatments, and at no time was an adequate kill achieved. Initially, method or volume of application had no effect on 2,4,5-T efficiency, but subse-

quently at 24 months there was a pronounced trend in favour of higher volumes with spray being better than mist application.

In Trial Z an attempt was made to assess the effect of root absorption of picloram and 2,4,5-T. On the basis of applying 1½ gal/acre of a proprietary formulation of picloram/2,4,5-T at a dilution rate of 1 in 200, individual bushes of standard size were sprayed with the separate components, 2,4,5-T amine and picloram (K salt) at 3 lb and 1 lb, respectively. These components were applied (a) to bushes with no ground protection, (b) to bushes with the ground screened and protected by plastic film to minimize root absorption and (c) ground application only. A control or standard treatment included was 5.4 lb of the butyl ester of 2,4,5-T.

A summary of results 12 months after application is shown in Table 4.

TABLE 2: FINAL PERCENTAGE KILL OF GORSE—OTAGO

<i>Trial No.</i>	<i>U</i>	<i>V</i>	<i>W</i>	<i>X</i>
<i>Date Sprayed</i>	<i>Feb.</i> <i>1965</i>	<i>Feb.</i> <i>1964</i>	<i>Feb.</i> <i>1964</i>	<i>Dec.</i> <i>1963</i>
<i>Time elapsed (mon.)</i>	23	15	15	12
<i>Treatment (lb)</i>				
Picloram (K salt) 0.25	0			
Picloram (K salt) 0.37		9		
Picloram (K salt) 0.75		10	6	30
Picloram (K salt) 1.5		54	18	50
Picloram (K salt) 3			37	85
B-2,4,5-T 4	70	90	95	70
Amine 2,4,5-T 4 + picloram (amine)				
1.5	30			
Amine 2,4,5-T 2 + picloram (amine)				
¾	2			
B-2,4,5-T 4 + picloram (K salt) ¼	60			
Amine 2,4,5-T 4 + picloram (K salt)				
¼	3			
Amine 2,4,5-T 2 + picloram (K salt)				
¼	8			

TABLE 3: COMPARISON OF PERCENTAGE KILL FROM MIST AND SPRAY APPLICATIONS—TRIAL Y

	<i>Picloram 2 lb</i>				<i>B-2,4,5-T 4.5 lb</i>			
	<i>Mist</i>	<i>Spray</i>	<i>Mist</i>	<i>Spray</i>	<i>Mist</i>	<i>Spray</i>	<i>Mist</i>	<i>Spray</i>
<i>Volume per acre</i>	250	500	500	1,000	250	500	500	1,000
<i>Time elapsed:</i>								
6 mon.	17	19	17	30	95	95	93	91
12 mon.	15	15	16	24	60	75	78	90
24 mon.	10	7	10	15	25	30	45	60

TABLE 4: PERCENTAGE KILL OF GORSE—TRIAL Z

		<i>Picloram 1 lb</i>			<i>2,4,5-T (amine 3 lb)</i>			<i>B-2,4,5-T 5 lb</i>
		<i>No. Grnd. Pro- tectn.</i>	<i>Grnd. Pro- tectn.</i>	<i>Grnd. Appln.</i>	<i>No. Grnd. Pro- tectn.</i>	<i>Grnd. Protec- tion</i>	<i>Grnd. Appln.</i>	<i>No. Grnd. Pro- tectn.</i>
Time elapsed:								
7 mon.		31	29	12	4	15	nil	85
12 mon.		39	32	11	2	14	nil	90

Picloram (no ground protection) was extremely variable within its four replicates but mean percentage kill was only fair. Only a small loss in effectiveness occurred through the reduction of picloram absorption in the root zone; this loss in activity was very approximately matched by the small amount of activity recorded through application to the root zone only. Amine salt of 2,4,5-T had little effect within any method of treatment, although there was some improvement through the reduction of 2,4,5-T in the root zone. The butyl ester of 2,4,5-T was highly efficient throughout.

DISCUSSION

The two series developed along separate but relatively consistent lines. In Wellington, the main comparison was between picloram/2,4,5-T mixtures and 2,4,5-T alone, whereas in Otago it was mainly a comparison between picloram and 2,4,5-T, both alone. At Wellington only, dicamba was examined, but, with only moderate results from highly uneconomic rates, this material is not likely to be of economic importance.

Apart from one exceptional result (Trial F), 2,4,5-T at 2 lb/acre gave inadequate results, 4 lb failed to achieve really high standards (except again in Trial F), and it is probable that 6 or even 8 lb 2,4,5-T/acre may be necessary for really effective control with little regrowth within an 18 to 24 month period.

It was reported that normally 2,4,5-T was quicker in action than picloram/2,4,5-T, although in this series the tank-mix of 2,4,5-T and picloram salt was nearly as rapid and in addition was somewhat superior to 2,4,5-T/picloram amines. No explanation can be offered for this phenomenon. Although the speedier action is of little importance agriculturally, the reduction in regrowth through the addition of picloram to 2,4,5-T is of considerable importance.

No comparable trends were detected in the Otago series, where 3 lb picloram had to be applied before better control than 2,4,5-T was achieved. The poor results with picloram alone are in agreement with Patterson (1964, 1965), and the poor response to 2,4,5-T amine alone (in Trial Z) would indicate that some synergistic effect may be involved where good response to picloram/2,4,5-T mixtures occurs.

With reference to technique, it was shown that, at volumes of 250 gal and above, picloram gave no response either to method or volume. From this it might be concluded that the volume of 120 gal mist in the 1966 Otago series was not at fault for the poor results, particularly as a higher percentage kill was recorded with 2 lb picloram in these trials than with 250 to 1,000 gal in the technique trial.

Where high or ultra-high volumes are used, "run-off" may assist kill by depositing picloram within the drip-line of a gorse bush and through added absorption through the roots. However, Trial Z indicated that only approximately 10% response may be gained through the application of picloram to the root area. The poorer response to 2,4,5-T amine where the soil was not protected from "run-off" was anomalous.

It is difficult to draw any definite conclusions from this work because of differences between the two areas both in treatments examined and in response to treatment. This work shows that a very high level of gorse kill (99% or better) is required at the peak of activity within 6-10 months of application. Where this high level of kill is not achieved, then picloram/2,4,5-T mixtures may reduce the amount of regrowth occurring.

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