

FORMULATIONS OF PICLORAM WITH 2,4,5-T FOR BRUSHWEED CONTROL

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Summary

A summary of results is presented of 62 field trials comparing 2,4,5-T (as an ester) with five formulations of picloram/2,4,5-T combinations as foliar spray applications to gorse (*Ulex europaeus*), blackberry (*Rubus fruticosus*), sweet brier (*Rosa rubiginosa*) and broom (*Cytisus scoparius*). Picloram formulations with 2,4,5-T were herbicidally more effective than 2,4,5-T ester alone on all species. Formulations containing picloram as either the iso-octyl ester or the potassium salt in combination with 2,4,5-T ester are more active than formulations of the triethanolamine salts.

INTRODUCTION

INITIAL New Zealand investigations with picloram and picloram/2,4,5-T mixtures on hard-to-kill scrub weeds (Pengelly, 1963; Patterson, 1964; Foreman, 1964; Pengelly and Ferguson, 1964) indicated that such mixtures resulted in a much higher degree of control than was previously possible with phenoxyacetic herbicides alone, when treatments were applied during the active summer growth period.

The object of the present study was to evaluate the effectiveness of several forms of picloram combined with 2,4,5-T ester in comparison with the standard commercial treatments of 2,4,5-T ester alone or the combination of triethanolamine salts of picloram plus 2,4,5-T.

This paper presents a summary of 62 trials conducted throughout New Zealand on gorse (*Ulex europaeus*), blackberry (*Rubus fruticosus*), sweet brier (*Rosa rubiginosa*) and broom (*Cytisus scoparius*). With the picloram/2,4,5-T ester combination, control of resprouting has been more complete over a wider range of application times than was possible with 2,4,5-T ester alone. The results with winter applications have not yet been adequately evaluated.

EXPERIMENTAL

FORMULATIONS

The following formulations were evaluated:

Active Ingredient	lb*/gal	Form	Code†
2,4,5-T	3.6	butoxyethanol or iso-octyl ester	2,4,5-T
picloram	0.75	triethanolamine salt	0.75 lb amine
2,4,5-T	2.0	triethanolamine salt	
picloram	0.5	triethanolamine salt	0.5 lb amine
2,4,5-T	2.0	triethanolamine salt	
picloram	0.5	iso-octyl ester	0.5 lb ester
2,4,5-T	2.0	iso-octyl ester	
picloram	0.5	potassium salt	0.5 lb K/salt
2,4,5-T	2.0	iso-octyl ester	

*All rates are expressed in lb active ingredient.

†This code reference is used in the text to describe the formulations, followed by the dilution proportions in water used for trial applications.

Two other formulations, containing 0.5 lb picloram as the acid plus 2 lb 2,4,5-T as the iso-octyl ester, and 0.5 lb picloram plus 2 lb 2,4-D as the triethanolamine salts, were also evaluated. Though the former showed initial activity at least equal to the equivalent 0.5 lb picloram ester formulation, it was discontinued because the formulation lacked stability. The picloram/2,4-D formulation showed adequate activity on broom only and is discussed under that section.

METHODS

High-volume treatments at 250 to 300 lb/sq. in. pressure were made using standard brush gun equipment, applying 10 to 15 gal spray mix per plot, on typical dense stands of mature 3 to 6 ft high scrubweed. Spray was applied just to the point of run-off to be comparable with normal field treatment to give an equivalent application of 400 to 600 gal of spray mix per acre of continuous brush canopy. Visual ratings were made by at least two independent observers using a 0 to 10 scale, 0 indicating no effect, 10 being the maximum effect. Ratings made between 1 and 4 months after treatment are based on the evaluation of brown-off of foliage and upper stems. Suppression of shoot regrowth was evaluated at inspections made 6 months or more after treatment.

RESULTS

GORSE

Graphs summarizing the mean results of 24 trials on gorse in the North Island and of 10 trials in the South Island are presented in Figs. 1 and 2. The majority of trials were laid during the normal recommended application period of active shoot growth (October to March). Conclusive data from the few trials laid outside this period have not yet been obtained. The results of brown-off ratings obtained in the 1- to 4-month period after treatment in the South Island trials correlate closely with the regrowth suppression ratings made after 12 to 18 months, and also the ratings for

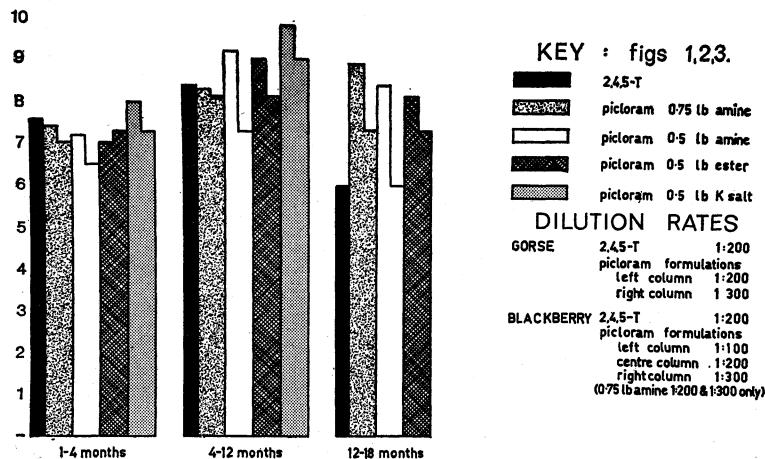


FIG. 1: Summary of North Island gorse trials.

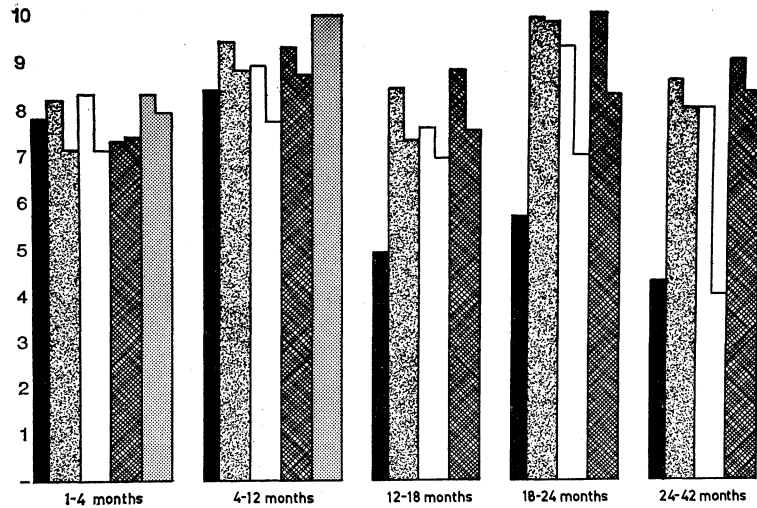


FIG. 2: Summary of South Island gorse trials.

final kill after 24 to 42 months. A similar correlation appears over the 1- to 4-month and 12- to 18-month period in the North Island trials. It is expected that this will continue in these trials until the evaluation for degree of final kill can be made.

BLACKBERRY

A graph summarizing the mean of the ratings of 16 trials on blackberry in North Taranaki, Waikato and Hawke's Bay is presented in Fig. 3. The 1:100 dilution rate appears necessary for a high degree of regrowth suppression, with a repeat application still necessary for complete kill.

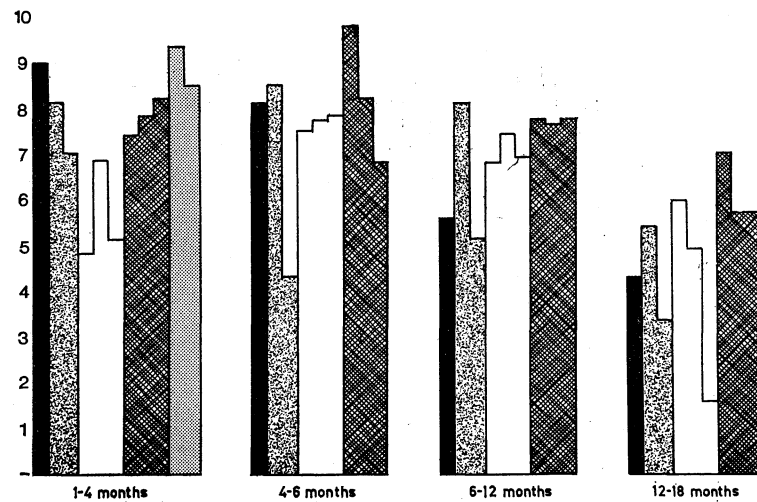


FIG. 3: Summary of North Island blackberry trials.

2,4,5-T at the recommended rate of 1:180, and the 1:200 and 1:300 dilutions of most picloram formulations have given a high degree of initial stem kill into the following season only. After this period, strong regrowth of basal crown shoots may occur, particularly from 2,4,5-T treated bushes which within 24 months were often completely regrown.

From follow-up studies on sprayed blackberry, effective practical treatment could consist of an initial stem kill with 2,4,5-T followed by burning and then spot treatment of the regrowth with the picloram/2,4,5-T ester mixture at the 1:100 rate. In localities where blackberry has proved tolerant to 2,4,5-T alone, the picloram mixture should be the preferred treatment.

SWEET BRIER

A summary of results of six sweet brier trials in the South Island are presented in Table 1.

The three spray methods for treatment of sweet brier with picloram/2,4,5-T mixtures, at the recommended rates, have all given satisfactory regrowth suppression, the high concentrate overall and basal misting methods being particularly successful. Basal misting treatments were applied in diesel oil to the lower 18 in. of the stems, only oil-miscible ester formulations being used. Overall misting treatments were applied in water. These results with low-volume applications suggest that aerial application of the active picloram/2,4,5-T ester formulation is now worthy of trial investigation during the most susceptible early spring stage of growth, from bud burst to full leaf.

BROOM

Six trials were laid in the South Island during the September-January period on "whippy" broom up to 6 ft high. A summary of results is presented in Table 2.

Broom has proved very susceptible to picloram, regardless of the form of picloram or combined phenoxyacetic acid used. Alone, 2,4,5-T has produced variable results, giving acceptable long-term control in Trial 4 only.

DISCUSSION AND CONCLUSIONS

The present trial data support the conclusion of Moffat (1965) and Leonard (1965) that the evaluation of final kill of these brush weeds from such a highly residual chemical as picloram cannot be obtained in the season of application. At the end of the second growing season, 12 to 18 months after treatment, an accurate assessment of final kill is normally available.

In only one broom trial has 2,4,5-T alone given an acceptable level of final brushweed control. Comparing the various formulations of picloram, the 0.5 lb ester formulation has given control clearly superior to the 0.5 lb amine formulations, and equal to the 0.75 lb amine formulation, on all four brushweed species. With gorse, if the high degree of correlation between initial brown-off ratings and final kill shown by both the 0.75 lb amine and 0.5 lb ester formulations of picloram with 2,4,5-T is a consistent and valid effect, then indications are that the 0.5 lb potassium salt is likely to be the most herbicidally active form of picloram to blend with 2,4,5-T ester as a combined emulsifiable concentrate.

TABLE 1: SUMMARY OF SWEET BRIER TRIALS

Treatments (lb)	Dilution	Trials (3-6 mon)			Trials (6-12 mon)			Trials (12-18 mon)			Trials (33 mon)	
		1	2	3	1	2	3	1	2	3	1	
High volume:												
picloram 0.75/2,4,5-T 2.0 (amine salts)	1:200	9.5						9.4	10			9.0
	1:300	7.7						5.2	10			5.5
picloram 0.5/2,4,5-T 2.0 (amine salts)	1:200								10			
	1:300								10			
picloram 0.5/2,4,5-T 2.0 (esters)	1:200								10			
	1:300								10			
Overall misting:												
2,4,5-T 3.6 (ester)	1:32	4.5	9.5		5.9	8.0		2.9	6.0			6.0
picloram 0.75/2,4,5-T 2.0 (amine salts)	1:32	9.5	10		9.6	8.5		9.9	10			10
	1:64	10	10		9.6	7.5		9.0	10			8.3
picloram 0.5/2,4,5-T 2.0 (amine salts)	1:32	10	10		9.6	10		9.2	10			10
	1:64	10	10		9.0	9.0		9.1	10			10
picloram 0.5/2,4,5-T 2.0 (esters)	1:32								10			
	1:64								10			
Basal misting:												
2,4,5-T 7.2 (ester)	1:72	9.5										6.0
picloram 0.5/2,4,5-T 2.0 (esters)	1:50	8.0										10
	1:100											10

TABLE 2: SUMMARY OF BROOM TRIALS (HIGH VOLUME)

Treatments (lb)	Dilution	Trials					
		1 (3 mon)	2 (11.5 mon)	3 (4 mon)	4 (6 mon)	5 (12 mon)	6 (29 mon)
2,4,5-T	1:200	7.0	7.5	8.5	9.2	5.8	8.0
	1:300		6.5	8.5	5.8	5.9	6.0
picloram 0.75/2,4,5-T 2.0 (amine salts)	1:200	8.5	7.6	10	9.2	10	10
	1:300	8.0	6.5	8.5	10	10	10
	1:400			7.2	10	10	
picloram 0.5/2,4,5-T 2.0 (amine salts)	1:300	9.5					
	1:400	8.0					
picloram 0.5/2,4,5-T 2.0 (iso-octyl esters)	1:200		6.6	9.0	9.2		10
	1:300		6.0	9.0	7.2		10
picloram 0.5/2,4-D 2.0 (amine salts)	1:200					9.1	10
	1:300					6.5	8.5
	1:400					7.6	7.2

Even where regrowth has occurred in picloram/2,4,5-T treatments, symptoms of leaf cupping and severe distortion of the apical shoots are characteristically present. These symptoms of growth retardation can persist for up to three years after treatment. The highly active and persistent nature of picloram is demonstrated by the final die-back of regrowth at the end of the second growing season often seen following treatment of gorse and sweet brier.

Further work is being conducted to evaluate more critically the potassium salt formulation of picloram combined with 2,4,5-T ester applied during the periods of more dormant brushweed growth (autumn to early spring). Lower volume aerial and misting applications where less complete coverage is possible (less than 100 gal/acre) are also worthy of study using this highly active formulation of picloram/2,4,5-T combination.

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