'NON-HORMONE' HERBICIDES FOR GORSE CONTROL

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SUMMARY

Herbicides which may be useful for gorse control in 'hormone' sensitive areas were tested at different rates and dates of application, using different methods of application. Metsulfuron-methyl gave good control, and glyphosate with surfactant (Triton X-45 or Silwet L77) was also potentially effective. Amitrole T was also effective in most cases. Tebuthiuron gave variable results but may be worth further investigation. Ammonium sulphamate and glufosinate-ammonium were relatively ineffective. Further work is needed on the more promising herbicides to check optimum rates and application dates.

INTRODUCTION

2,4,5-T alone or in combination with other herbicides is widely used for gorse control. For best results, these materials need to be applied between November and February (Thompson 1973) when horticultural crops are susceptible to herbicides. Increased planting of such crops in recent years has increased the risks of spray drift damage. Although any herbicide can 'drift' if applied carelessly most damage is caused by 'hormone' preparations such as 2,4-D or 2,4,5-T. Many pasture weeds can be controlled during the period considered safe for horticultural crops, but this is not so for gorse. There is therefore a need to examine the alternatives to 2,4,5-T for gorse control.

Ammonium sulphamate (AMS), amitrole plus ammonium thiocyanate (amitrole T), glyphosate plus surfactant and hexazinone are registered for use on gorse. Rolston and Devantier (1983) did not find AMS effective. The same authors found that soil-applied hexazinone was effective on small bushes, but not on bushes over 1 m high. Coackley and Moore (1977) found that established gorse was scarcely affected by 10.8 kg ai/ha of hexazinone, although gorse regrowth after burning was suppressed for 7 months by 5.4 kg ai/ha. Preest (1980) achieved control of soft-spined seedlings at 4 kg ai/ha, but control was less effective once the spines had hardened. Glyphosate alone does not appear to be very effective on gorse (Ivens 1977; McCavish 1980), although Preest (1980) achieved good control of young seedlings at 4 kg ai/ha. Lane and Park (1984) showed that the activity of glyphosate on gorse was markedly enhanced by the addition of the surfactants Triton X45 or Silwet L77. Tebuthiuron, glufosinate-ammonium and metsulfuron-methyl are not registered in New Zealand. Tebuthiuron is used for brushweed control in parts of the USA. Glufosinate-ammonium is a non-selective herbicide which will control certain legumes. The potential of metsulfuron-methyl for gorse control was demonstrated by Cornwell and Christie (1984).

All of these herbicides were tested in the experiments described here, with the exception of hexazinone, whose main use for gorse control is probably in pine plantations.

MATERIALS AND METHODS

Four experiments were carried out near Palmerston North and one (Expt. 3) near Woodville. For each treatment in each experiment 7-10 isolated bushes, representing a range of sizes, were sprayed. Herbicide formulations used were:

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2,4,5-T	IWD Hi-ester 2,4,5-T (72% ai)
ammonium sulphamate (AMS)	Ammate XL (80% ai)
amitrole + ammonium	
thiocyanate (amitrole T)	Weedazol 4-L (40% + 10% ai)
glyphosate	Roundup (36% ai)
tebuthiuron	Spike 80W (80% ai) (not registered NZ)
metsulfuron-methyl	DPX-T6376 (75% ai) (not registered NZ)
glufosinate-ammonium	Basta (20% ai) (not registered NZ)

2,4,5-T treatments served as controls in all experiments. In all experiments except Expt. 3, high water rates were used so that coverage and penetration of the spray was as effective as possible. Dilution rates used for registered herbicides included label recommendations and for new herbicides were as suggested by the proprietor. Plants were scored for necrosis and/or death at 1 or 2 monthly intervals.

Herbicides used and dates of application were as shown in Tables 1-4. Other experimental details are as follows:

Experiment 1:

Bushes sprayed to run-off, using a TG5 solid cone nozzle on a knapsack sprayer operating at 400kPa. Water rate used equivalent to 14,000-19,000 litres/ha. Bushes about 3 years old at spraying, average height 70 cm, average area covered 0.34m². Agral LN at 1 ml/litre spray solution added to all herbicides. Final assessments at 2 years after spraying.

Experiment 2:

Bushes sprayed to run-off with a gorse gun (No. 4 tip) at 1200kPa. Water rate 4 litres/min, equivalent to 9000 litres/ha. Bush height at spraying 1.5-2.5 m, average area covered ca 4 m². Agral LN added to all herbicides at 1 ml/litre spray solution. Final assessments at 2 years after spraying.

Experiment 3:

Bushes sprayed to uniform coverage with a motorised knapsack sprayer with ULV attachment at 120 ml/min (April) or 210 ml/min (December). April treated bushes 66 cm average height, 0.67 m² average area covered. December treated bushes 84 cm average height, 0.92 m² average area. Agral LN at 0.5% V/V added to all herbicide mixtures except 2,4,5-T. Final assessments at 16-24 months after spraying.

Experiment 4:

Spraying method as for Experiment 1. Water rate used ca 20,000 litres/ha. Bushes about 4 years old at spraying, average height 82 cm, average area covered 0.44 m². Final assessments 13-16 months after spraying.

Experiment 5:

Spraying details and bush sizes as for Experiment 2. Final assessment 12-16 months after spraying.

RESULTS

The time taken for bushes to 'brown-out' varied with herbicide and application date (Table 1).

TABLE 1: Approximate time (months) for average bush brown-out to reach 75%, averaged over all rates in all experiments.

Herbicide	Date of application				
	Dec	Jan	Feb	Apr	Jun
2,4,5-T	2	2	2	3	7
amitrole T	3	-	5	-	5
AMS	6	-	4	-	4
metsulfuron-methyl	2	-	3	12	9
glufosinate	1	-	-	-	-
glyphosate	-	1	-	2	-
tebuthiuron	2	-	2	-	7

TABLE 2: Percentage of gorse bushes killed in Expts. 1 and 2.

Herbicide	g ai/litre	Expt. 1				Expt. 2			
		g ai/ bush	applied			g ai/ bush	applied		
			Dec	Feb (1982-83)	Jun		Dec	Feb (1982-83)	Jun
2,4,5-T	1.3	0.6–0.8	100	100	63	-	-	-	
	2.6	1.2–1.6	100	100	75	8	100	80	
AMS	16	7.5–10.5	25	29	13	-	-	-	
	32	15–21	63	88	50	103	20	10	
amitrole T	2	0.9–1.3	50	63	88	-	-	-	
	4	1.8–2.6	100	100	100	12	90	50	
tebuthiuron	0.5	0.2–0.3	57	71	100	-	-	-	
	1.0	0.4–0.6	86	100	86	3	60	67	
metsulfuron- methyl	0.4	0.17–0.24	100	100	88	-	-	-	
	0.8	0.34–0.48	100	100	100	3	100	100	

The effects of herbicides in killing gorse bushes are shown in Tables 2-4. 2,4,5-T killed over 80% of treated bushes when applied in December to April (except in Experiment 5). AMS gave poor control (Table 2) as did glufosinate-ammonium (Table 3). Tebuthiuron gave inconsistent results (Table 2). Amitrole T was very effective at the higher rate in Experiment 1, but gave poor control when applied in February in Experiment 2 (Table 2). Metsulfuron-methyl killed most bushes treated in Experiments 1 and 2, and was also effective at the highest rate used in December in Experiment 3.

TABLE 3: Percentage of gorse bushes killed in Expt. 3.

Herbicide	g ai/litre	Applied (1983)			
		Apr		Dec	
		g ai/ bush	%dead	g ai/ bush	%dead
2,4,5-T	72	4.0	100	7.2	90
metsulfuron-methyl	2.5	-	-	0.4	10
	5	0.2	20	0.7	60
	10	0.6	50	1.4	100
glufosinate- ammonium	4	-	-	0.7	0

TABLE 4: Percentage of gorse bushes killed in Expts. 4 and 5.

Herbicide	g ai/ litre	Expt. 4			Expt. 5		
		g ai/ bush	applied		g ai/ bush	applied	
			Jan	Apr		Jan	Apr
			(1984)			(1984)	
2,4,5-T	1.3	1.0	90	-	4.2	50	-
	2.6	2.0	-	80	8.4	-	90
glyphosate + Triton X-45	3.6 0.5% } 3.6 0.5% }	2.8	100	100	9.0	90	100
glyphosate + Silwet L77	3.6 0.25% }	2.8	90	100	9.0	100	100
glyphosate + Silwet L77	1.8 0.25% }	1.4	90	-	4.5	100	-

The results of glyphosate plus surfactant application (Table 4) appear promising, although only 13-16 months have elapsed since spraying. On most bushes there has been no sign of regrowth and dead plant material has started to break down.

All the materials, except for 2,4,5-T killed the pasture around the gorse bushes. In Experiment 1, tebuthiuron effects lasted for 12 or more months, metsulfuron-methyl for 8-12 months and AMS or amitrole T for 5-10 months. Glyphosate bared the ground only temporarily, and invasion by thistles was very rapid.

DISCUSSION

High water rates and therefore high herbicide rates were used in most of these experiments, so that spray coverage was very good. Under these circumstances, at the dilution rates used, metsulfuron-methyl gave as good control as 2,4,5-T except when applied through a motorised knapsack sprayer on one date. Lower rates could possibly be used. Tebuthiuron may have performed better at higher concentrations, but its severe and long-lived effects on pasture species are a disadvantage.

The best alternatives to 2,4,5-T for gorse control in 'hormone' sensitive areas appear to be metsulfuron-methyl, amitrole T and, possibly, glyphosate plus surfactant. Further work may be required to ascertain optimum dilution rates and dates of application.

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