THE EFFECT OF METSULFURON ON SWEET BRIER

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SUMMARY

Metsulfuron was applied to sweet brier (*Rosa rubiginosa*) at different rates, either aerially or to individual bushes. For reliable control when using a knapsack sprayer on individual bushes, rates should be over 14 g ai/100 litres water. For aerial application, the lowest rate tested, 100 g ai/ha, killed all bushes. Browntop and other grasses were unaffected, but broadleaf species were eliminated and re-introduction of white clover may be difficult for over 9 months after application, especially in drier environments.

INTRODUCTION

Meeklah and Mitchell (1981) have shown that sweet brier can be reliably controlled by the application of concentrated herbicides to individual bushes using 'spot-guns'.

While this method is satisfactory for control of discrete bushes scattered over improved rangeland, there are situations where broadcast application is more appropriate. So far, this has been carried out by applying picloram/2,4,5-T by helicopter, using the half overlap reverse pass technique for maximum coverage to achieve a high degree of kill. There is some field evidence that only a limited period, November to December, is suitable for maximum kill. Picloram residues may persist for up to 2 years in the dry environments where brier is common.

A successful pilot trial indicated that metsulfuron could be an alternative to picloram/2,4,5-T with a lesser residue problem. This paper reports the results of field trials with metsulfuron on sweet brier kill, and the associated monitoring of herbicide residues.

MATERIALS AND METHOD

The six experimental sites used in this study were in Central Otago. The soils were silt loams with organic matter levels of 2.6 to 4.5%.

At Springvale, Queensberry and Luggate, metsulfuron (Escort) was applied by knapsack sprayer to lightly wet the foliage of individual bushes.

At Moutere, Lowburn and Tarras, treatments were applied by helicopter in 220 litres water/ha using the half overlap reverse pass method, except for one extra plot at Moutere where application volume was 60 litres water/ha in a single pass.

Mean bush sizes at each site were as follows: Springvale 1.7 m high x 0.3 m basal stool diameter (BSD) (range $\pm 0.2 \times 0.1$ m), Luggate 1.8 x 0.34 m BSD ($\pm 0.2 \times 0.1$ m), Moutere 1.1 x 0.23 m BSD ($\pm 0.65 \times 0.15$), Lowburn 1.6 x 0.35 BSD ($\pm 0.9 \times 0.27$), Tarras 1.3 x 0.24 BSD ($\pm 0.8 \times 0.23$) Queensberry 1.8 x 0.32 BSD ($\pm 0.2 \times 0.1$ m).

Assessments in the small plot trials were made 2 years, and in the aerial trials 16 months, after spraying. All bushes were assessed for percent dead wood per bush. In the aerial trials three belt transects (30 m x 1 m) per plot were assessed. Rates of chemical and dates of application are shown in Table 2.

In March and May 1985, soil samples 0-5 and 5-10 cm deep were taken at random across all aerially sprayed plots. Further soil samples were taken in September 1985 at the Moutere site. Bulked soil samples, plus a composite of 0-10 cm deep, were potted according to site and seeded with 'Grasslands Tama' ryegrass (*Lolium multiflorum*) and white clover (*Trifolium repens*) after each sampling. Pots were kept in a shade house,

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and were bottom watered. Plant emergence and thrift were assessed at intervals (Tables 3 and 4).

The effect on non-target species was noted in the aerial trials. In all cases the pasture community was dominated by browntop (*Agrostis capillaris*). Other species were danthonia (*Rytidosperma* spp.), sweet vernal (*Anthoxanthum odoratum*), cocksfoot (*Dactylis glomerata*), and various herbs such as *Crepis* spp., clovers (*Trifolium* spp), and St. Johns wort (*Hypericum perforatum*).

RESULTS

Rainfall at the aerially sprayed sites during the period of observation is shown in Table 1.

TABLE 1: Rainfall (mm) at aerially sprayed sites taken from date of spraying and between soil sampling dates.

	Dec '84-Mar '85	Mar-May '85	May-Sept '85
Moutere	84	22	94
Lowburn	141	29	173
Tarras	146	41	217

The percent dead wood/bush from knapsack applications at Luggate and Queensberry (Table 2) rose with increased rate but had not reached 100% at 14 g ai/100 litres.

Complete kills were obtained with all rates applied by air at Lowburn and Tarras with only one bush surviving in the single pass treatment at Moutere (Table 2).

At all sites grasses appeared unaffected in vigour and frequency, but herbs were eliminated. Sixteen months after application herbs were re-establishing at all sites.

Of the associated scrub species, matagouri (*Discaria toumatou*) was killed, but *Coprosma* spp. and *Pittosporum* spp. survived.

TABLE 2: Mean percent dead wood/bush, 24 (knapsack) and 16 (aerial) months after spraying metsulfuron.

		g ai/100 litres		
		3.5	7.0	10.5
Knapsack (applied 8 Feb 1984)				14.0
Queensberry	33	56	59	91
Luggate	5	5	62	84
		g ai/ha		
		100	200	300
Aerial (applied 8 Dec 1984)				300*
Moutere	100	100	100	99.7
Lowburn	100	100	100	
Tarras	100	100	100	
No. of bushes counted	431	412	338	174

* Single pass, low water rate.

Bioassays for metsulfuron residues (Tables 3 and 4) showed that germination and emergence of both Tama and white clover were not affected. However effects on Tama vigour were severe at 3 months (300 g ai/ha only) but barely detectable at 5 months.

Vigour of white clover was more severely affected at all rates and for a longer period. Data from individual sites are not shown, but adverse effects from residues were greater in the 0-5 cm soil horizon and were most severe at the Moutere site where rainfall was lowest. Residue effects on clover had largely disappeared at Lowburn and Tarras from samples taken in May 5 months after spraying.

TABLE 3: Soil bioassay for metsulfuron residues at three sampling dates. Percent plant emergence, following aerial application. 8 December 1984 (mean of three sites).

Rate g ai/ha	Soil depth: Date sampled:	0-5 cm			Tama Ryegrass 5-10 cm			0-10 cm		
		Mar	May	Sept*	Mar	May	Sept*	Mar	May	Sept*
Nil		85	91	80	80	77	80	91	89	84
100		73	88	52	87	80	84	72	80	68
200		83	76	84	80	85	96	91	80	76
300		85	79	80	84	80	80	89	85	100
White Clover										
Nil		68	84	72	85	77	80	64	87	72
100		73	73	40	73	88	80	75	92	88
200		76	84	76	89	80	92	84	77	92
300		87	72	72	88	83	68	87	80	96

* only the Moutere site was sampled in September.

TABLE 4: Soil bioassay for metsulfuron residues. Effect on plant thrift* at time of maximum herbicide effect (ie., 29, 55, and 190 days after sowing in March, May and September** respectively).

Rate (g ai/ha)	Soil depth: Date sampled:	0-5 cm			Tama Ryegrass 5-10 cm			0-10 cm		
		Mar	May	Sept	Mar	May	Sept	Mar	May	Sept
Nil		4.3	3.8	5.0	3.8	3.7	5.0	4.3	4.0	5.0
100		4.0	3.7	5.0	4.2	3.8	5.0	3.8	4.0	5.0
200		3.8	3.7	5.0	4.3	3.7	5.0	4.0	3.8	5.0
300		2.7	3.7	5.0	3.5	3.3	5.0	2.5	3.7	5.0
White Clover										
Nil		4.2	3.3	5.0	4.7	3.2	5.0	3.5	3.2	5.0
100		2.7	2.3	2.0	3.5	3.2	3.0	3.2	3.2	3.0
200		2.0	2.8	2.0	3.3	2.5	5.0	2.0	2.8	3.0
300		1.8	2.3	1.0	2.7	2.8	4.0	2.2	2.5	3.0

**Moutere site only

*Key to plant thrift values:

Ryegrass

1. Leaves short, twisted, needle-like.
Ht 55 mm.
2. Leaves short, spindly, needle-like.
Ht 55 mm.
3. Leaves short and blades 1mm wide.
Ht 65 mm.
4. Leaves vigorous and blades 1.5 mm wide. Ht 85 mm.
5. Leaves vigorous and blades 3.0 mm wide. Ht 105 mm.

Clover

- Only cotyledons present, often red or purple.
- Cotyledons green and rudimentary spade leaf.
- Cotyledons green and long spade leaf petiole.
- Cotyledon and spade leaf normal, plus rudimentary trifoliate leaf.
- Trifoliate leaves on most plants.

DISCUSSION

An initial pilot trial laid down at Springvale, November 1982, but not described here, showed 100% kill of sweet brier from metsulfuron at 7, 14 and 35 g ai/100 litres and from picloram/2,4,5-T at 50/200 g ai/100 litres.

The results from this and the knapsack applications (Table 2) suggest that the concentration of metsulfuron for reliable kill of sweet brier should be greater than 14 g ai/100 litres. However, variability occurs between operators so that even at the same concentration the amount applied per bush may vary.

More reliable indications of the efficacy of metsulfuron were obtained in the aerial trials. The predicted rates of herbicide necessary for sweet brier control were too high, as complete kill was obtained at all rates. The material is so effective that it may be possible to reduce application costs by reducing the spray volume from 220 to 60 litres/ha in a single pass, as indicated in the one plot at Moutere.

An important factor to be considered where a herbicide is to be broadcast over scrub infested areas is the tolerance of non-target species. In this work limited observations suggested that the grass species associated with a sweet brier community, mainly browntop and sweet vernal with some cocksfoot, should survive with no loss in vigour at rates necessary for brier control. However, the associated herbs were eliminated, and the persistence of metsulfuron can affect the re-establishment of important productive species such as clover.

The results of soil bioassays using ryegrass and clover as indicators suggest that both should germinate satisfactorily in the presence of metsulfuron residues 3 months after application. But vigour of both species may be affected initially, with clover vigour affected even if sown in the following spring, 9 months after application. However this is likely to occur only on sites where rainfall is low, similar to that at Moutere. Observations at the aerially sprayed sites in autumn 1986 (16 months after spraying) showed that many herbs, including volunteer white clover and haresfoot trefoil (*Trifolium arvense*) were well established and as vigorous as those in untreated areas.

We concluded that metsulfuron at 100 g ai/ha should give good control of sweet brier without serious effect on the associated grass species. Further work is necessary to investigate lower rates, and field establishment of clovers and cocksfoot, both considered essential for improvement of depleted tussock grasslands and to inhibit further scrub establishment.

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REFERENCES

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