EVALUATION OF METSULFURON FOR PRE-PLANT CONTROL OF GORSE IN FORESTRY

NOEL DAVENHILL and DAVID PREEST

Forest Research Institute, Rotorua

SUMMARY

Metsulfuron showed promise for the pre-plant control of 2-3 year old seedling and coppice regrowth gorse (*Ulex europaeus*) in five small-plot trials in the central North Island. The use of a surfactant greatly increased its efficiency. Rates of metsulfuron of the order of 0.3 kg ai/ha (plus surfactant) gave good results on soft gorse in early summer but higher rates may be required when applied in winter. Metsulfuron may not be as effective as 2,4,5-T or 2,4,5-T/picloram in inhibiting gorse regrowth long-term, and some soil residue problems necessitate a cautious approach to its use for forest site preparation.

INTRODUCTION

Metsulfuron is a sulphonyl urea compound active at low rates on many herbaceous and woody broadleaf weeds. It is currently registered as a 600 g/kg water-dispersible granule (methyl ester; "Escort") for the control of blackberry, bracken, privet, fennel, and a wide variety of broadleaf weeds. Although primarily foliage-absorbed, it does have significant soil activity.

The activity of metsulfuron on gorse and other legumes has already been reported. Cornwell and Christie (1984) showed that it was highly active on gorse applied as a high-volume foliage spray during active growth at 37.5 g ai/100 litres. Popay *et al* (1985) observed generally good gorse control from metsulfuron plus surfactant ("Agral LN") applied at 0.4 and 0.8 g ai/litre in high volumes by knapsack sprayer and at 4 g ai/litre in low volumes by mistblower. Balneaves (1985a; 1985b) observed good kills of gorse and broom (*Cytisus scoparius*) from December hand-boom-applied sprays of 0.75 kg ai/ha plus surfactant (0.2% Silwet L-77), but poor results with no surfactant. Our first indications of promising activity by metsulfuron on gorse came from an unreplicated trial laid down at Galatea in summer 1981/82. Metsulfuron was applied at 1 and 2 kg ai/ha.

This paper summarises results from five trials with metsulfuron on gorse in the Rotorua area undertaken between December 1982 and March 1985.

METHODS

Three of the five trials were located in an old paddock at Rotokawa, adjacent to Rotorua airport, and two at Galatea, 50 km south-west of Rotorua. All were on light, free-draining, pumice soils. At Rotokawa the gorse was almost entirely of coppice origin, having been rotary slashed for several years. Gorse regrowth for the first Rotokawa trial (Table 2) was 15-75 cm tall. At the time of the first treatment (mid January) it was approximately 1.5 years old with the new season's growth almost complete and beginning to harden off. By the time of the two later treatments (late March and mid July) it was fully hardened off. When the second (August 1984; Table 3) and third (March 1985; Table 5) Rotokawa trials were laid down, the gorse was also fully hardened off, and was 50-100 cm and 70-120 cm tall respectively.

The first Galatea trial (Table 1) was on dense 60-100 cm seedling and coppice regrowth gorse which developed after crushing and burning approximately 3 years previously. The second Galatea trial (Table 4) was on 2 year old, 50-100 cm tall coppice arising after rotary slashing the seedling and regrowth gorse which had developed after crushing and burning 2 years prior to that.

Proc. 39th N.Z. Weed and Pest Control Conf.

All five trials were of randomised block design with either three or four replicates. In two of the Rotokawa trials, one comparing metsulfuron with and without surfactant (Table 2), and the other comparing metsulfuron with two different surfactants (Table 5), the comparisons were superimposed as split-plot treatments on the basic randomised block design.

The main treatment plots for all trials were 4 m wide, but varied in length from 7-10 m. All treatments were applied as aqueous sprays using a 4 m, CO₂-pressurised, precision boom sprayer fitted with Spraying Systems 730077 flat-fan nozzles, and operated at 276 kPa. Each application was in two passes of 150 litres/ha. Gorse foliage brown-off, stem dieback, and regrowth are the averages of subjective visual estimates by three assessors.

TABLE 1: The effect of metsulfuron and 2,4,5-T/picloram applied to seedling and coppice gorse at Galatea on 7.12.82.

Herbicide	Rate kg ai/ha	% foliage brown-off		% stem-length dieback after 6 months	% stems regrowing after 11 months
		After 7 weeks	After 6 months		
metsulfuron	0.25	5.8a ¹	87.7a	62.0a	51.1a
	0.50	11.7a	96.3ab	74.3b	12.1a
2,4,5-T/picloram ²	2.50	93.0b	99.3b	95.7c	2.2b

¹ LSD tests at 5% level. Numbers followed by the same letter are not significantly different.

² "Tordon Brushkiller DS": 400 g/litre 2,4,5-T butyl ester plus 100 g/litre picloram amine salt; rate shown is sum of both.

RESULTS AND DISCUSSION

Activity of metsulfuron on gorse was confirmed by the December 1982 trial at Galatea (Table 1), although at the highest rate of 0.5 kg ai/ha it was usually inferior in foliage brown-off, stem dieback and regrowth suppression to 2,4,5-T/picloram.

The 1983 Rotokawa trial (Table 2) also indicated that metsulfuron was inferior in foliage brown-off and regrowth suppression to 2,4,5-T/picloram when applied alone at

TABLE 2: The effect of metsulfuron and 2,4,5-T/picloram applied to coppice gorse at different times of the year at Rotokawa.

Application date	Herbicide	Rate kg ai/ha	% foliage brown-off		% stems regrowing
			20.7.84	22.8.85	
12.1.83	metsulfuron	0.25	3.9a ¹	0	100 a
		0.5	6.7a	0	100 a
		1.0	15.5a	0	100 a
	2,4,5-T/picloram	2.5	99.3c	*	3.3b
31.3.83	metsulfuron	0.5	17.2a	0	100 a
		1.0	51.1b	0	100 a
	2,4,5-T/picloram	2.5	77.1b	*	90.6a
14.7.83	metsulfuron	0.5	98.2c	96	10.1b
	plus 0.1% v/v surfactant ²	1.0	99.7c	96	4.4b

¹ LSD tests at 1% level. Numbers followed by the same letter are not significantly different.

² "Multifilm X-77": alkylaryl polyoxyethylene glycol wetting and penetrating agent. The decision to use only the higher rates and add a surfactant was consequent on the relatively poor results from the earlier treatments which had become apparent by July.

* Not assessed.

0.25 to 1.0 kg ai/ha to soft gorse in mid-summer. A slight improvement in metsulfuron activity was recorded from the late March application, accompanied by an expected fall-off in 2,4,5-T/picloram activity. There was an unexpected increase in the activity of metsulfuron when applied with a surfactant in July. Brown-off developed very slowly but the results were similar to those achieved by 2,4,5-T/picloram applied in mid-summer. This improvement cannot be ascribed to the addition of surfactant, the winter application, or a combination of both. In winter, rates of metsulfuron of 0.5-1.0 kg ai/ha plus surfactant may be necessary to give results comparable with 2,4,5-T/picloram applied in mid-January.

TABLE 3: The effect of metsulfuron with and without surfactant applied in winter (22.8.84) to coppice gorse at Rotokawa.

Spray formulation	Rate kg ai/ha	% foliage brown-off	
		At 12 months	At 19 months
metsulfuron	0.3	60 c ¹	4.3 c
without surfactant	0.4	70 bc	8.9 c
	0.5	89.4ab	19.8bc
metsulfuron with 0.1% v/v surfactant ²	0.3	96.3a	54.2ab
	0.4	99.0a	73.3a
	0.5	99.5a	81.5a

¹ LSD tests at 1% level. Numbers followed by the same letter are not significantly different.

² "Triton X-45": 100% alkyl aryl polyether alcohol.

The addition of surfactant significantly improved brown-off after 12 months at the lower rates of metsulfuron but not at the 0.5 kg ai/ha rate applied in August (second Rotokawa trial, 1984; Table 3). A reduction in brown-off ratings after 19 months indicated that appreciable regrowth was occurring.

The pronounced surfactant effect was confirmed in the December 1984 Galatea trial (Table 4). Its presence doubled the foliage brown-off achieved by metsulfuron at 0.27 kg ai/ha. This trial also showed no significant difference between rates of metsulfuron applied at 0.27, 0.53, and 0.80 kg ai/ha (all with surfactant) in foliage brown-off ratings 3, 4 and 13 months after treatment. At most times these were inferior to both 2,4,5-T at 9.6 kg ai/ha and 2,4,5-T/picloram at 6.67 kg ai/ha.

In the March 1985 Rotokawa trial (Table 5), although Silwet L-77 was used at only half the concentration of Triton X-45 (following label recommendations), it was the better surfactant overall ($P < 0.01$)

TABLE 4: The effect of metsulfuron, 2,4,5-T and 2,4,5-T/picloram applied to seedling and coppice gorse at Galatea on 19.12.84.

Herbicide	Rate kg ai/ha	% foliage brown-off		
		After 3 months	After 4 months	After 13 months
metsulfuron (no surfactant)	0.27	40.0a ¹	46.3a	34.2a
metsulfuron plus 0.1% v/v X-45	0.27	82.5b	94.7b	94.3b
metsulfuron plus 0.1% v/v X-45	0.53	85.0b	96.0b	95.7b
metsulfuron plus 0.1% v/v X-45	0.80	87.5b	94.7b	95.7b
2,4,5-T ²	9.60	100 c	100 c	97.0b
2,4,5-T/picloram	6.67	99.0c	100 c	100 c

¹ LSD tests at 5% level. Numbers followed by the same letter are not significantly different.

² "Broadside": 600 g/litre 2,4,5-T octyl ester

TABLE 5: The effect of two surfactants used with metsulfuron applied to coppice gorse at Rotokawa on 11.3.85.

Spray formulation	Rate kg ai/ha	% foliage brown-off		% Stems regrowing after 12 months
		After 5 months	After 12 months	
metsulfuron plus 0.2% v/v X-45	0.3	50.0ab ¹	94.8a	20.7a
metsulfuron plus 0.2% v/v X-45	0.4	35.0a	95.5ab	10.3bc
metsulfuron plus 0.2% v/v X-45	0.5	55.0abc	95.4a	6.7cd
metsulfuron plus 0.1% v/v L-77 ²	0.3	63.3abc	98.4abc	15.0ab
metsulfuron plus 0.1% v/v L-77	0.4	85.0bc	98.8bc	3.7d
metsulfuron plus 0.1% v/v L-77	0.5	89.3c	99.1c	2.7d

¹ LSD tests at 5% level. Numbers followed by the same letter are not significantly different

² Silwet L-77 ("Pulse"): 100% silicone polyalkylenoxide copolymer

CONCLUSIONS

1. Metsulfuron shows promise as an alternative to 2,4,5-T and 2,4,5-T/picloram for controlling seedling and coppice gorse up to 2-3 years old. However, even at 0.8 kg ai/ha it does not appear to be as effective as 2,4,5-T/picloram in inhibiting regrowth over the longer term.
2. The effectiveness of metsulfuron for gorse control is dependent on the use of a good surfactant, and at label rates Silwet L-77 was superior to Triton X-45.
3. Metsulfuron rates of the order of 0.3 kg ai/ha (plus surfactant) gave adequate results when applied to soft gorse in early summer, but higher rates (plus surfactant) may be required for effective control in winter.

Foliar applications of metsulfuron are known to be damaging to radiata pine (*Pinus radiata*). Several Forest Research Institute trials (not reported here) have also indicated damage to radiata pine (and other species) from soil residues, even when planting is delayed until 3 months after treatment. Thus, while metsulfuron is a promising alternative for pre-plant gorse control where 2,4,5-T, 2,4,5-T/picloram or triclopyr cannot be used, caution should be exercised in its use until more is known about possible residue effects.

ACKNOWLEDGEMENTS

Technical assistance was provided by Harold Sanderson and Dean Bowden, and computer analyses by Michael Hong. Du Pont (New Zealand) Ltd provided the metsulfuron.

REFERENCES

- Balneaves, John M., 1985a. Effect of herbicides on gorse in a dry year. *Proc. 38th N.Z. Weed and Pest Control Conf.*: 92-93.
- Balneaves, John M., 1985b. The effect of added surfactant on the performance of scrubweed herbicides. *Proc. 38th N.Z. Weed and Pest Control Conf.*: 98-101.
- Cornwell, M.J. and Christie, M.S., 1984. Preliminary results with DPX-T6376 for control of gorse and blackberry. *Proc. 37th N.Z. Weed and Pest Control Conf.*: 197-199.
- Popay, A.I., Rolston, M.P. and Edmonds, D.K., 1985. 'Non-hormone' herbicides for gorse control. *Proc. 38th N.Z. Weed and Pest Control Conf.*: 94-97.