

EFFECTS OF METSULFURON-METHYL ON PASTURE

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SUMMARY

Metsulfuron-methyl, at 18 g ai/ha, seriously damaged ryegrass (*Lolium perenne*) and white clover (*Trifolium repens*). Bare ground resulting from use of higher rates was colonised by other grasses and weeds. Yields of browntop (*Agrostis capillaris*) dominant swards were only temporarily reduced. Ryegrass and white clover oversown 5 or more months after treatment usually established satisfactorily. In limited bio-assay studies, residues of metsulfuron-methyl in the soil had disappeared after 3 months.

INTRODUCTION

Metsulfuron-methyl (formerly DPX-T6376) has shown potential as a scrub weed herbicide (Cornwell and Christie 1984). For some uses, its acceptability in this role will depend on its effect on pasture species. Cornwell and Christie (1984) mentioned that clovers and broadleaf weeds were eliminated and, at some sites, so were grasses. They also suggested that growth of cocksfoot (*Dactylis glomerata*), browntop and paspalum (*Paspalum dilatatum*) was usually only checked.

The results of more detailed assessments of the effects of the herbicide on some pasture species are presented.

MATERIALS AND METHODS

Shown in Table 1 are brief details of the 9 experiments. Treatments were arranged in 4 or 5 randomised blocks. The herbicide was applied with precision spraying equipment delivering 170-400 litres ha. Assessments of herbicidal effects on pasture were made by measuring dry matter yields, herbage dissection, or estimating cover either visually or by point analysis.

TABLE 1: Experimental details.

Expt No.	Location	Pasture type ¹	Rates g ai/ha ²	Sprayed	Oversowing Date	spp ¹
1	Hawkes Bay	rg/wc	188, 375, 750	May 82	May 83	rg
2	Canterbury	rg/wc	75, 188, 375, 750	Apr 82	Sep 82 Nov 82	rg/wc rg/wc
3	Canterbury	rg/wc	38, 75, 150, 375	Sep 82	May 83	rg/wc
4	Manawatu	rg/wc	18, 35, 70, 140	Oct 82	May 83	rg/wc
5	Manawatu	bt	88, 175, 350, 700	Nov 83	—	—
6	Manawatu	bt	88, 175, 350, 700	Nov 83	May 84 Sep 84	wc wc
7	Manawatu	bt	30, 60, 120, 240	Mar 84	May 84 Sep 84	wc wc
8	Hawkes Bay	bt	23, 45, 113	Nov 83	—	—
9	Hawkes Bay	bt	23, 45, 113	Feb 84	—	—

¹rg - ryegrass; wc - white clover; bt - browntop

²70 or 75% formulation of metsulfuron-methyl

Proc. 38th N.Z. Weed and Pest Control Conf.

TABLE 2: Effect of metsulfuron-methyl on yields and composition of ryegrass/white clover pasture.

Harvest date		0 kg DM/ha	Herbicide rate (g ai/ha)			
			188	375	750	
		DM yield relative to untreated (= 100)				
17.9.82		1518	24	16	6	
28.10.82		4454	38	26	13	
28.11.82		7842	50	30	36	
		% ground cover				
17.9.82	Total	98 ¹	74 ²	63 ²	30 ²	
	ryegrass	62	37	3	1	
28.10.82	Total	100 ¹	89 ²	71 ²	33 ²	
	ryegrass	48	14	4	0.3	
28.11.82	Total	100 ²	81 ²	65 ²	42 ²	
	ryegrass	31	8	3	0.4	
29.6.83	Total	100	90	82	42	
20.9.83	Total	96	96	86	68	
Assessment date		0	Herbicide rate (g ai/ha)			
			38	75	150	
		% ground cover				
2.12.82	ryegrass	71	37	10	3	0.3
20.4.83	Total	95	19	14	8	3
	ryegrass	79	5	2	0	0
Harvest period		0 kg DM/ha	Herbicide rate (g ai/ha)			
			18	35	70	
		DM yield relative to untreated (= 100)				
28.10-23.11		2423	11	11	9	7
30.11-9.1		1513	13	5	0	0
17.1-13.2		704	50	29	21	0
10.3-19.4		1246	61	77	58	41
30.4-31.7		2233	73	52	35	15
20.8-6.10		3223	83	77	70	38
22.10-7.11		1999	79	83	84	73
(Plots grazed between harvest periods)						
Date		% DM composition				
19.4.83	ryegrass	72 ¹	86	73	58	25
	other grasses	2	4	5	3	12
	weeds	0	10	22	39	63
6.10.83	ryegrass	75	90	77	66	41
	other grasses	18	9	22	32	58

¹most of difference due to white clover²most of difference due to Yorkshire fog and barley grass

Ryegrass, white clover or both, were oversown or drilled in most experiments 2 to 12 months after herbicide application (Table 1). Paraquat treatment killed existing vegetation. Establishment of oversown species was measured by visual assessment of seedling vigour, seedling counts or dry matter yields.

In Expts. 6 and 7, six soil samples (24 mm diameter to a depth of 75 mm) were taken from each plot at monthly intervals after herbicide application. Soil samples were bulked for each treatment and were bioassayed in the glasshouse for residues, using radish (*Raphanus sativus*) and white mustard (*Sinapis alba*) with techniques outlined by Rahman and Cox (1975).

RESULTS

Pasture production and composition:

Metsulfuron-methyl, at all rates, killed white clover. It severely checked ryegrass at all rates and killed most plants at rates of 140 g ai/ha.

Rates of 18 g ai/ha reduced ryegrass/white clover production for up to a year (Table 2) and at higher rates bared the ground. Within 2 to 4 months, Yorkshire fog (*Holcus lanatus*), browntop, soft brome (*Bromus mollis*), barley grass (*Hordeum murinum*), twin cress (*Coronopus didymus*), black nightshade (*Solanum nigrum*) and Scotch thistle (*Cirsium vulgare*) invaded bare areas.

Metsulfuron-methyl reduced browntop pasture production by 30-45% at 3 of 5 sites, but only at the first cut (Table 3). It increased pasture yields in two experiments (8 and 9) in the autumn following application, despite a reduction in browntop cover (Table 3).

TABLE 3: Effects of metsulfuron-methyl on yields and composition of browntop swards.

Expt No	Harvest date	0 kg DM/ha	Herbicide rate (g ai/ha)					LSD (5%)	
			23-30	45-60	88-120	175-240	350		700
			Yield relative to untreated (= 100)						
6	15.12.83	668	-	-	81*	77*	77*	71*	6.8
			(no sig. diff. at later assessments)						
7	6.4.83	1091	93	87*	76*	71*	-	-	11.1
			(no sig. diff. at later assessments)						
8	1.12.83	3051	92	56*	56*	-	-	-	17.9
	4.1.84	4079	117	104	95	-	-	-	56.4
	5.3.84	843	168	141	197*	-	-	-	84.5
	5.4.84	538	244*	239*	285*	-	-	-	100.2
	28.5.84	487	117	116	228*	-	-	-	98.7
9	5.3.84	843	125	-	108	-	-	-	50.8
	5.4.84	538	260*	-	219*	-	-	-	105.4
	28.5.84	487	175*	-	198*	-	-	-	61.1
			% ground cover of browntop						
8	1.12.83	44	43	50	54	-	-	-	31.4
	4.1.84	72	50	52	54	-	-	-	29.6
	5.3.84	73	24*	19*	10*	-	-	-	18.7
	5.4.84	50	22*	15*	16*	-	-	-	18.5
	28.5.84	52	27	33	29	-	-	-	31.2
	20.6.84	37	35	22	22	-	-	-	16.9
9	5.3.84	73	11*	37*	17*	-	-	-	29.3
	5.4.84	50	22*	24*	26	-	-	-	24.5
	28.5.84	52	54	48	36	-	-	-	21.5
	20.6.84	37	38	28	54	-	-	-	31.3

*significantly different from untreated

TABLE 4: Relative dry matter yield of mustard seedlings (% of untreated) grown in soil taken from the top 75 mm of treated plots in Expts. 6 and 7.

Herbicide rate (g ai/ha)	Expt. 6			
	Months after treatment			
	0	1	2	3
0	100	100	100	100
88	28	59	84*	106*
175	15	37	62	118
350	0	9	49	135
700	0	0	34	160
Total rainfall since treatment (mm)	0	34	95	199
	Expt. 7			
	1	2	3	4
0	100	100	100	100
30	73	106*	109*	107*
60	57	80	130	102*
120	42	54	130	106*
240	30	39	165	108*
Total rainfall since treatment (mm)	114	167	313	367

*not significantly different from untreated controls: pooled SED ($p < 0.05$) = 7.1

Oversowing:

White clover and ryegrass usually established successfully when re-introduced into treated plots 5-12 months after application. Establishment was not successful where May oversowing closely followed March treatment in Expt. 7 and at both drilling dates in Expt. 2. In Expt. 2, rainfall was below average and crusted soil surface and strong drying winds contributed to poor establishment.

Soil residues:

Herbicide residues, measured by bio-assay in Expts. 6 and 7, had disappeared within 3 months of application (Table 4).

DISCUSSION AND CONCLUSION

Metsulfuron-methyl severely damaged white clover and ryegrass. By contrast, rates as high as 700 g ai/ha only temporarily suppressed yields of browntop swards. The rapid invasion of certain broadleaf and grass weeds in treated plots suggested that they showed some tolerance of herbicide residues.

Probable recommendations for use of metsulfuron-methyl will be as a directed spray for scrub weed control at 10-20 g ai/100 litres. These rates would kill ryegrass and white clover but would only have a small, temporary effect on browntop.

Under normal rainfall, and suitable over-sowing conditions, clovers and ryegrass could be re-introduced within 6 months of application.

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