PASTURE TOLERANCE TO SPRING APPLICATIONS OF THE HERBICIDE THIAMETURON-METHYL

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SUMMARY

The tolerance of pasture species to broadcast applications of thiameturon-methyl (10 - 40 g/ha), 2,4-D (1.1 kg/ha) and asulam (1.2 kg/ha) was investigated in a sheep and a dairy pasture. Both thiameturon-methyl and 2,4-D reduced the clover content. Composition of pastures treated with asulam did not change substantially. Most treatments reduced the total herbage yield, particularly over the first few weeks. Most visual damage was removed by the first grazing, although plots treated with 30 and 40 g/ha of thiameturon-methyl were still obvious by their reduced growth and compositional changes. At 10 or 15 g/ha, thiameturon-methyl damage to pasture was no more than that caused by 2,4-D or asulam treatments.

INTRODUCTION

The sulfonylurea herbicide thiameturon-methyl (DPX-M6316) is a highly active post-emergence chemical which selectively controls a wide range of broadleaf weeds in cereal crops (Ambach *et al* 1984; Sionis *et al* 1985). In combination with other herbicides it has also shown potential as a post-emegence herbicide for weed control in maize (Eberlein *et al* 1988; Scott and Kapusta 1987). Thiameturon-methyl has very short soil residual activity, with a half life of less than 1 week (Beyer *et al* 1987), because of its exceptionally rapid degradation by soil micro-organisms (Brown *et al* 1987).

In 1986 the herbicide DPX-L5300 was introduced into New Zealand for spot treatment of ragwort (*Senecio jacobaea*) and certain thistles in pastures. Because of its similarity to DPX-L5300 and its possible greater selectivity (observational data), the herbicide thiameturon-methyl was also evaluated for use in pasture. The present study reports on the tolerance of pasture species to broadcast applications of this herbicide in spring.

MATERIALS AND METHODS

In October 1987 a randomised block design trial with four replications was laid down on two sites at the Ruakura Agricultural Centre, Hamilton. Site 1 was on a Horotiu sandy loam soil (8.1% organic C, pH 6.0) and was grazed by sheep throughout the trial period. Site 2 was on a Te Kowhai silt loam soil (9.2% organic C, pH 5.6) and was grazed by dairy cattle. Both sites were relatively weed free established pastures.

Site 1 was grazed 12 days before treatments were applied on 17 October while Site 2 was grazed 10 days before treatment application on 12 October 1987. Treatments were thiameturon-methyl (Harmony) at 10, 15, 20, 30 and 40 g/ha, 2,4-D (Hi-Ester 2,4-D) at 1.1 kg/ha, asulam (Asulox) at 1.2 kg/ha and an untreated control.

Treatments were applied to 3 m x 10 m plots with a hand-held precision sprayer delivering 300 litres/ha at 210 kPa, using fan nozzles. An anti-drift agent was applied in solution with 2,4-D treatments at Site 1. Weather conditions at both sites were favourable during application, although light rain fell 6 hours after application at Site 2. The rainfall for the months of October to February was 91, 56, 86, 15 and 15 mm respectively.

Herbage dissection samples were taken from control plots just prior to treatment application, and from all plots approximately 6 weeks and 14 weeks after application.

Pasture herbage dry matter was measured by mowing two, 3 m long strips per plot at approximately 3, 6, 10, 14 and 19 weeks after treatment. Visual assessments of treatment effects on the pasture were made 1 week after application and thereafter at the time of each dry matter sampling. A detailed description of treatment effects on the main pasture species was made 2 weeks after treatment and general comments on plant health and vigour were recorded throughout the trial period.

RESULTS

Visual effects

All rates of thiameturon-methyl produced some damage symptoms on all pasture species. In ryegrass (*Lolium perenne*) a purplish discolouration developed within 2 weeks of spraying, starting from the tip of leaf blades and, more often, on the midrib side of the blade. This later turned to yellow and then, at higher rates to brown as the foliage died. The oldest or largest leaf of a tiller appeared most affected. Similar damage symptoms were also noticed on prairie grass (*Bromus willdenowii*) and Yorkshire fog (*Holcus lanatus*), although discolouration in these species was frequently in the form of continuous spots, higher in density towards leaf margins. In white clover (*Trifolium repens*) the leaflets and petioles showed a reddish purple discolouration initially, turning yellow with time. Clover leaves, 2 to 3 months after treatment, were very small and stolon growth was greatly reduced at the higher rates.

In asulam treatments both ryegrass and white clover showed yellowing within 3 weeks of treatment. Prairie grass showed a reddish discolouration, which was more severe on Site 1 where most of the prairie grass died.

Most of the discoloured tissue was removed by the first grazing after treatment. Following this, both thiameturon-methyl and 2,4-D treated plots had noticeably less clover. By December, the untreated plots and those treated with asulam were conspicuous by the large number of clover flowers in them.

TABLE 1: Effect of herbicide treatments on percent pasture composition 6 and 14 weeks after treatment (WAT).

Treatment		Ryegrass		Other grasses		White clover	
(Rate ai/ha)	WAT	6	14	6	14	6	14
		Site 1 — Horotiu sandy loam					
thiameturon	10 g	71	32	17	19	11	27
methyl	15 g	68	35	20	24	10	20
	20 g	67	29	25	24	8	20
	30 g	57	34	36	35	3	19
	40 g	53	33	43	33	3	17
2,4-D	1.1 kg	91	55	8	12	5	19
asulam	1.2 kg	75	44	5	13	14	24
untreated	—	77	36	9	15	21	30
LSD ($P<0.05$)		17	11	17	14	4	9
		Site 2 — Te Kowhai silt loam					
thiameturon-	10 g	80	49	9	7	10	17
methyl	15 g	78	60	9	5	12	21
	20 g	83	56	9	8	7	12
	30 g	80	61	14	14	5	10
	40 g	84	48	9	14	4	15
2,4-D	1.1 kg	82	52	10	10	8	20
asulam	1.2 kg	81	65	9	7	8	12
untreated	—	69	55	13	4	16	23
LSD ($P<0.05$)		12	13	NS	NS	7	7

Herbage composition

At the time of treatment, pastures at both sites were composed of approximately 72% ryegrass, 10% clover, 16% 'other grasses' and 2% weed and dead matter. The main compositional changes that occurred due to various treatments at the two sites are given in Table 1.

By 6 weeks after application, 2,4-D treatments at both sites had caused a severe reduction in the clover content, with no effect on 'other grasses', resulting in a proportional increase in the ryegrass component. Asulam treatments had little effect on ryegrass content but clovers were generally depressed, although not as severely as with the 2,4-D treatments at Site 1.

At Site 1 the two high rates of thiameturon-methyl had reduced the proportion of both ryegrass and white clover 6 weeks after treatment. By the end of January (14 weeks after treatment) the ryegrass was recovering well, but the clover content was still significantly lower than on untreated plots. The suppression of these species, however, allowed an increase in 'other grasses' which remained high throughout the trial period. At Site 2 the reduction in the clover content was associated with an increase in the ryegrass component, with little change in the amount of 'other grasses'. The two lowest rates of thiameturon-methyl were less damaging. The proportion of clover in these swards was not significantly reduced 6 weeks after treatment and compared favourably with asulam and 2,4-D treatments throughout the trial. Thus increasing the rate reduced the percent of clover in the sward at both sites but no clear rate response occurred with ryegrass.

Total herbage yield

The total herbage yield data (Table 2) show that all treatments of thiameturon-methyl at both sites, and 2,4-D and asulam at Site 1 had caused a significant reduction in total pasture production by 3 weeks after the application of treatments. In December, 6 weeks after treatment, however, no significant differences in yield were recorded at either site. Higher rates of thiameturon-methyl caused greater reduction in yield than lower rates, although the trend was not significant. The total yield suppression due to thiameturon-methyl treatments recorded 3 weeks after application was greater than the 2,4-D or asulam treatments. Herbage yields taken in January and February (not presented in Table) showed considerable variation due to drought stress with no apparent treatment effects.

TABLE 2: Effect of herbicide treatments on total herbage dry matter yield (data are percentages of untreated = 100).

Treatment (Rate ai/ha)		Site 1			Site 2		
	WAT*	3	6	10	3	6	10
thiameturon-methyl	10 g	48	78	77	61	114	63
	15 g	49	83	78	59	111	72
	20 g	45	81	92	59	106	69
	30 g	43	68	104	50	99	66
	40 g	38	70	97	44	104	67
2,4-D	1.1 kg	72	77	64	85	78	65
asulam	1.2 kg	60	100	110	87	105	93
untreated	(kg/ha)	2603	240	871	1571	506	478
LSD ($P<0.05$)		11	NS	24	17	29	29

*Weeks after treatment.

Yield of individual herbage components

Of the thiameturon-methyl treatments, only the 30 and 40 g/ha rate at Site 1 significantly reduced the growth of ryegrass 6 weeks after treatment, but the reduction did not persist to the end of January. The yield from the 'other grasses' component increased due to thiameturon-methyl treatments at Site 1, but no consistent increases occurred at Site 2 (Tables 1 and 2).

The two lower rates of thiameturon-methyl (10 and 15 g/ha) had lower clover yields compared with untreated 6 weeks after treatment, but differences were not significant at either site. Clover yields on these plots were as high or higher than from plots treated with either 2,4-D or asulam (except asulam at Site 1). At high rates of thiameturon-methyl the clover yields were reduced to levels similar to 2,4-D treatments. Although clover yields obtained in January 1988 were quite variable due to the dry conditions prevailing at that time, they do indicate that clover was recovering from the herbicide damage.

DISCUSSION

The first effects of treatments were visible 7 to 10 days after application and started as a discolouration of the foliage. Prior to the first grazing clovers were still abundant, although they appeared not to be growing as vigorously as on untreated plots. By 3 weeks after application, plots treated with thiameturon-methyl were severely discoloured and had visibly less herbage on them. Visual assessments made after the first grazing indicated clover regrowth on treated plots had been reduced especially by the higher rates of thiameturon-methyl and 2,4-D treatments. However, yields of both ryegrass and white clover 6 weeks after treatment were not significantly reduced by lower rates of thiameturon-methyl indicating that the pasture damage looked worse than was actually the case.

The high rates of thiameturon-methyl and 2,4-D caused significant damage to pasture, suppressing clovers and opening up the sward. At 10 weeks after application these treatments had significantly increased the percent of bare ground, compared with untreated controls, at Site 1 but not at Site 2. From the herbage composition data it is apparent that the 'other grasses' component became relatively more significant at Site 1, especially after the more damaging treatments were applied. Thus pasture damage allowed the ingress of opportunist or volunteer species, in this case mainly annual poa (*Poa annua*), prairie grass and summer grass (*Digitaria sanguinalis*).

January 1988 was particularly dry and pastures at both sites were visibly stressed over this time with considerable plant death occurring on some plots. This increased the variability within treatments through localised soil differences e.g. deeper top soil, depressions etc. It also created a significant dead matter component in the January dissections from both sites which did not appear to be influenced by treatments.

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