DAISY CONTROL AND PASTURE TOLERANCE

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SUMMARY

Paraquat, paraquat/diquat and diquat with or without added 2,4-D amine or 2,4-D ester consistently reduced daisy (*Bellis perennis*) populations in pastures by over 80%. Nitrogen in the form of sulphate of ammonia applied post-spraying assisted the recovery of the grasses which were damaged by the herbicides. Clover was more tolerant to paraquat and paraquat/diquat than to diquat alone. 2,4-D amine significantly reduced clover DM production when added to paraquat or diquat.

INTRODUCTION

Daisy is a prostrate perennial weed present in most pastures in lowland Otago and Southland where it may reduce pasture production. For example, Meeklah and Mitchell (1985) reported that a daisy cover of 28% in a pasture yielding 8,500 kg DM/ha, reduced total season DM by 500 kg/ha.

Daisy control methods using herbicides were reported by Meeklah *et al* (1981) and Mitchell and Meeklah (1986). In these studies reductions in daisy cover were recorded but in some trials the more effective herbicides caused severe damage to the clovers. This paper reports the results of two trials where paraquat and diquat plus 2,4-D and nitrogen were evaluated. The effects of the treatments on daisy populations were recorded as were changes in the clover content of the swards.

MATERIALS AND METHODS

Two trials were carried out, each consisting of treatments within four fully randomized blocks. Plot size was 10 m or 15 m x 1.5 m. Herbicides were applied with a modified Oxford Precision sprayer using 8002 fan nozzles delivering 250 litres/ha of water to ryegrass/clover pastures 3-8 cm high. Paraquat (Gramoxone) and diquat (Reglone) were applied at 0.2 kg/ha, paraquat/diquat (Spraygrow) at 0.2/0.3 kg/ha and two 2,4-D formulations (Weedar 77 and Hi-ester 2,4-D) at 1 kg/ha. Sulphate of ammonia as a source of nitrogen was applied by hand to the plots treated with herbicide. Percentage cover of daisy and clover was determined by point analysis in Trial 1, taking 100 points per plot, while dry matter production was measured in Trial 2.

Trial 1: Herbicide treatments (Table 1) were applied in either early October or late November 1984 to a pasture with 16% cover of daisies. Nitrogen at 84 kg/ha was applied to half of each sprayed plot within 1 week after spraying. Clover cover was recorded in April 1985 and daisy cover in October 1985.

Trial 2: Herbicides (Table 2) were applied on 11-11-86 to plots averaging 12% daisy cover. On 19-11-86 N was applied at 42 kg/ha as a single application and 1 m² exclusion cages were placed on each sprayed plot to prevent grazing. Herbage cuts from the total area of each cage were taken with a shearing hand-piece five times between 7-12-86 and 9-5-87 with a further cut on 28-10-87. The cages were then removed over summer and were replaced on each plot on 18-2-88. A final cut was taken on 28-3-88.

RESULTS

Trial 1: By October 1985 all herbicide treatments, except 2,4-D ester and paraquat/diquat applied in October 1984, had significantly ($P < 0.05$) reduced daisy cover (Table 1). Average cover was 3% in treated plots compared to 10% cover in untreated control. Over all treatments the addition of N improved the control of the daisies irrespective of time of application.

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TABLE 1: Effect of herbicide and sulphate of ammonia (N) on percentage clover cover (12.4.85) and percentage daisy cover (2.10.85) in Trial 1.

Treatments	Date of herbicide application							
	Early (17.10.84)				Late (27.11.84)			
	Clover		Daisy		Clover		Daisy	
	-N	+N	-N	+N	-N	+N	-N	+N
paraquat	33	19	1.75	1.25	43	26	2.75	1.5
2,4-D ester	20	19	8	3.75	29	9	4.25	1.5
paraquat + 2,4-D ester	35	33	5	0.75	47	34	2	1.25
paraquat/diquat	40	29	8.25	3.25	55	36	3.5	2.75
paraquat/diquat + 2,4-D ester	37	31	6	2.75	55	41	4	1.25
diquat + 2,4-D ester	27	16	2.75	1.0	26	11	3.25	1.5
paraquat + 2,4-D amine	27	16	2.5	0.5	29	17	2.75	2.5
untreated control	32		10.25		32		10.25	

LSD ($P < 0.05$) clover — 6 herbicide comparison with control— $7 \pm N$ comparisons

— 8 columns

daisy — 3.0 herbicide comparisons with control

— $4.6 \pm N$ comparisons

— 3.9 columns

Paraquat/diquat alone and with added 2,4-D ester and paraquat plus 2,4-D ester did the least damage to clover (Table 1). In the absence of N clover cover in sprayed plots was similar to that in the unsprayed control 6 months after spraying (Table 1). However, percentage cover of clover was reduced where N was applied after most herbicides.

Trial 2: Total daisy DM yield was reduced from 44 kg/ha (untreated) to below 6 kg/ha by each herbicide over the five cuts taken in the season following spraying (Table 2). Significant yield reductions remained in the three paraquat and in the paraquat/diquat plus either of the 2,4-D formulations at the final cut 28-3-88 taken 16 months after spraying. At this date, these treatments averaged 5 kg/ha DM compared to 25 kg/ha DM in the untreated plots.

TABLE 2: Herbicide effect on grass, clover (tonnes/ha) and daisy (kg/ha) DM yields (Trial 2).

Treatments Applied 11.11.86	1986-87 5 cuts			28.10.87 1 cut			28.3.88 1 cut		
	Grass	Clover	Daisy	Grass	Clover	Daisy	Grass	Clover	Daisy
paraquat	5.1	1.1	5	3.0	0.2	0	1.3	0.5	5
+ 2,4-D amine	5.1	0.5	1	2.7	0.1	0	1.4	0.3	6
+ 2,4-D ester	4.1	0.8	3	2.4	0.2	0	1.2	0.4	5
paraquat/diquat	4.2	1.1	1	2.8	0.3	0	1.2	0.4	16
+ 2,4-D amine	4.8	0.4	1	3.0	0.2	0	1.5	0.5	3
+ 2,4-D ester	4.3	1.0	5	2.6	0.2	0	1.3	0.5	5
diquat	5.8	0.4	1	2.0	0.2	6	1.3	0.3	9
+ 2,4-D amine	5.6	0.4	2	2.8	0.1	5	1.2	0.4	9
+ 2,4-D ester	5.7	0.4	6	2.6	0.2	2	1.5	0.4	8
untreated	5.3	0.9	45	2.4	0.2	6	1.1	0.4	25
LSD 5%	1.4	0.6	14	0.4	0.1	5	0.3	0.2	18
		1.7 ¹			0.4			0.3	

¹ LSD 5% for the combined grass/clover yield

In the season following spraying (to 9-5-87) the combined DM yield for grass and clover did not differ either between herbicide treatments or between any herbicide treatment and untreated control (Table 2). There were significant differences in grass and clover yields when comparing individual treatment effects. Diquat severely affected clover production whether applied alone or in combination with either 2,4-D formulation. The addition of 2,4-D amine to either paraquat or paraquat/diquat resulted in significantly reduced clover DM yields.

Some significant effects remained at the 28-10-87 cut (Table 2), but differences had largely disappeared by the final harvest 28-3-88.

DISCUSSION

Results from these and previously reported trials have shown that paraquat, paraquat/diquat and diquat consistently reduced daisy cover in grazing pasture by over 80%. The addition of 2,4-D amine or 2,4-D ester to these materials did not significantly improve each herbicide's performance and can cause severe clover damage. Nitrogen assisted pasture recovery by increasing grass growth but rates above 42 kg/ha seriously suppressed clover recovery. In a similar trial not reported here, the response to nitrogen was the same whether applied as a single or split application. A further trial, also unreported, showed pasture recovery could be seriously delayed by dry conditions after spraying. The greater effect on clover of diquat alone, compared with that of either paraquat or paraquat/diquat, reflects the activity of diquat on broadleaved plants and the rates at which it was applied (0.2 kg/ha on its own and at 0.03 kg/ha when in combination with paraquat).

Our trials have all been conducted on properties where fat lambs and wool are the farmer's main source of income. Lambs fatten more rapidly on clover dominant pasture (Lewis 1956; Jagusch *et al* 1981) and maximum live weight gains are not possible if clover growth is suppressed or eliminated in a ryegrass clover sward. Paraquat and paraquat/diquat are commonly used for grass suppression in grazing pastures and the recommended timing for this approach fits into the period in which we have achieved the best daisy control.

From earlier trial work daisy infestations do not appear to reduce pasture production until they occupy over 30% of available ground cover (Meeklah and Mitchell 1985). Where daisies are considered to be a problem in pasture, the application of paraquat or paraquat/diquat at the rates used here, will provide worthwhile control. Nitrogen applied after spraying will help maintain pasture production but in dry conditions recovery can be seriously delayed. Diquat should only be used if pasture damage to resident clovers is considered unimportant.

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