DAISY CONTROL IN PASTURES USING HERBICIDES AND NITROGENOUS FERTILIZERS

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SUMMARY

Paraquat and diquat either alone or in combination, significantly reduced daisy (*Bellis perennis*) cover in permanently grazed pastures. The application of nitrogen, as sulphate of ammonia, within 1 week of herbicide spraying, increased grass dry matter yields but depressed clover yields.

Nitrogen alone in the form of either sulphate of ammonia or nitro-lime applied as a single or split applications over the growing season gave only a temporary reduction in daisy cover.

INTRODUCTION

Daisy (*Bellis perennis*) is common in many high producing pastures in South Otago and Southland. Infestation densities vary, but in late spring and early summer the multitudes of white flower heads suggest that the plant provides serious competition for grasses and clovers. The weed is more noticeable in short pastures but can survive in long pastures (e.g. hay paddocks) even when available light to the plant is severely reduced for lengthy periods.

This daisy has a prostrate growth habit, and the leaves, although eaten by sheep, do not grow erect or long enough for control by grazing. Trampling seems to have little effect, and heavily stocked areas may provide ideal conditions for the weed to spread vegetatively (Warwick and Briggs 1980) and for seedling establishment in the well trodden turf.

Very little published data relating to daisy control in pasture exists. Holly (1949) achieved 99% control of daisies with 1 kg ai/ha of MCPA applied three times during a season. Zondewijk (1955) found that 2,4-D applied in mid-summer was superior to MCPA, but neither paper reported the effect of these chemicals on pasture production, especially clover. Meeklah *et al* (1981) reported that neither clover-damaging, nor clover-tolerant chemicals, gave adequate control of daisies in a sheep grazing situation. However, in a direct drilling trial, paraquat alone and in combination with 2,4-D amine achieved promising results in comparison with other herbicides.

Meeklah and Mitchell (1985) found that annual pasture production was reduced by only 500kg/ha (or 5% of total) by a daisy infestation which occupied 28% of available ground cover when assessed in early spring.

This paper reports the effects on daisies of low rates of herbicides commonly used in pasture renovation. Artificial nitrogen was also used to examine its use for daisy control, and to increase pasture production and compensate for the check induced by paraquat/diquat and 2,4-D.

METHOD

Six trials (A-G) each of a four replicate randomised block design were laid down in South Otago (A, C) and West Otago (B, D, E, F) on all grass farms. Daisy populations varied from site to site, ranging from 20-24% ground cover.

Trials A, B, C and D assessed the effects of nitrogen alone on daisy populations. Sulphate of ammonia and nitro-lime were applied by hand at different rates of N (0, 21, 42, 63 and 84 kg/ha) as either single or split applications over the growing season. Treatment effect on daisy populations in these trials was monitored by point analysis taking one hundred points per plot to give percent ground cover comparisons.

Trials E and F, shown in Tables 1 and 2 respectively, compared the combined effect of herbicides plus sulphate of ammonia on daisy control, and on pasture production. Cages of 1 m^2 were placed on all plots in each trial within 1 week of spraying and on the same day as sulphate of ammonia was applied.

Herbage cuts were taken using a shearing hand piece four times (Jan-April) from Trial E, and five times (Dec-April) from Trial F. A cut taken from Trial E in December 1983 was not analysed due to cages being moved by stock and is not included in the results.

Ground cover occupied by daisies and/or clover in Trials E and F was measured by point analysis (100 points/plot) at various times during the year following treatment.

Herbicides were applied with a modified Oxford Precision sprayer at 250 litres/ha through 8002 fan nozzles at 175 kPa. Plot size was 10 x 1.5 m for all six trials. Trial sites were not fenced and were grazed according to farm routine.

RESULTS

Effect of nitrogen alone on daisies

Trials A, B, C, D: Point analyses up to 12 months following application showed some small temporary reductions in daisy cover but differences between types and rates of N were inconsistent and inconclusive. Only in Trial D did sulphate of ammonia applied twice (each 42 kg N/ha) significantly reduce daisy cover when compared with nitro-lime at one and two times of application and untreated control.

Dry conditions in South Otago caused the daisy population to collapse in late summer and autumn and no final counts were taken from Trials A and C.

Herbicides plus sulphate of ammonia

Trial E: Table 1 shows total dry matter production of grass and clover from four cuts.

TABLE 1: Trial E. Effect of herbicides ± sulphate of ammonia* on pasture D.M. yields and daisy and clover ground cover 1983/84.

	Rate (kg ai/ha)	Total DM yield (4 cuts) (kg/ha)				% Ground Cover					
		Grass		Clover		Daisies				Clover	
						12.1.84		21.11.84		24.2.84	
		+N	-N	+N	-N	+N	-N	+N	-N	+N	-N
paraquat	0.2	5710	4370	410	1230	3.5	2.5	5	6	27	39
2,4-D amine	1.0	4890	3630	210	950	2	6	6	10	18	39
paraquat/ 2,4-D amine	0.2/1.0	5610	3960	450	1420	1.75	0.5	4	3	31	45
2,4-DB	1.0	4510	3320	570	1010	9	12	13	22	23	43
bentazon	1.0	3910	3250	550	1140	8	13	17	23	26	46
2,4-D ester	1.0	4680	3860	420	1030	2	3	6	8	20	41
mecoprop	1.0	5570	3120	30	510	15	19	16	21	8	21
paraquat/ diquat	0.2/0.03	5320	3940	870	1330	3	3.5	5	6	38	56
bentazon/ MCPB	1.0/1.0	4280	3800	270	840	11	14	13	22	24	47
untreated		3950	4010	450	850	16	17	18	25	22	42
Mean		4840	3730	440	1030						
	LSD 5	1745		750		5.4	3.9	5.7	6.7	10	10

*Sprayed 17 November 1983 and sulphate of ammonia (84 kg/ha N) applied 23 November 1983.

Mecoprop (Mec 40) with nitrogen and the three paraquat treatments with and without nitrogen produced higher total season grass DM yields than all other herbicide treatments. 2,4-DB (Rural 2,4-DB 40), bentazon (Basagran), mecoprop and bentazon/MCPB failed to give satisfactory daisy control (Table 1). Paraquat (Gramoxone), paraquat/2,4-D, paraquat/diquat (Spraygrow), 2,4-D amine (Shell

2,4-D amine) and 2,4-D ester (Hi-ester 2,4-D) all significantly reduced daisy cover. However, total season grass/clover DM production in the 2,4-D treatments was 1000 kg/ha less than that from each of the paraquat treatments when nitrogen was added. The addition of nitrogen increased grass DM yields in all herbicide treatments and although overall, clover DM yields were reduced by 50%, only in the paraquat ± 2,4-D treatments was this significant. Paraquat/diquat produced the highest clover DM yields when compared to other herbicides with and without nitrogen. One year after application, daisy cover in both 2,4-D formulations and all paraquat treatments, was still significantly less than that in untreated control.

Trial F: In this trial daisy cover was significantly reduced by all treatments with no apparent increase in control with the inclusion of nitrogen (Table 2).

TABLE 2: Trial F. The effect of herbicides* and nitrogen on pasture production and daisy cover 1984/85.

	Rate (kg ai/ha)	Sulphate of ammonia kgN/ha	Total DM yield (5 cuts) (kg/ha) Grass	Clover	% Daisy cover 17.12.84	1.4.85	11.10.85
paraquat	0.2	0	4150	2030	3.5	5.25	5.5
		42	5750	1320	2	4	5
		84	6410	1030	1.75	3	5
paraquat/ diquat	0.2/0.03	0	4560	1460	0.75	5.25	6.5
		42	4840	1640	1.25	3.25	2.5
		84	5030	1650	1.25	3.75	4.5
paraquat/ 2,4-D amine	0.2/1.0	0	4270	940	1.25	3.75	5
		42	6030	710	1	2.5	3.5
		84	6220	760	1	1.5	2.5
untreated		0	5360	1750	24	26	25
	LSD 5%		660	414	2.2	4.1	4.3
	,,			730†			

* Herbicides applied 20 November 1984 and nitrogen 6 days later.
† this figure represents LSD 5% for the combined grass/clover yield.

Grass yields were significantly increased in both paraquat and paraquat/2,4-D treatments when nitrogen was added and total season grass yields were significantly higher than untreated control but there were no significant differences between the two rates of nitrogen.

Clover production was significantly less from all paraquat/2, 4-D and the paraquat plus nitrogen treatments when compared with untreated control. The addition of nitrogen to paraquat treated plots resulted in a significant loss in clover yield compared with paraquat/no nitrogen treatment.

Without nitrogen paraquat/2,4-D yielded significantly less total season grass/clover DM than paraquat and paraquat/diquat and all three treatments yielded less than the untreated control. The addition of nitrogen increased paraquat and paraquat/2,4-D total dry matter yields due solely to the large increase in grass weights. Paraquat/diquat showed a slight increase in both grass and clover DM yields when nitrogen was added.

DISCUSSION

Ground cover by daisies can be reduced by over 85% in early summer with 2,4-D and paraquat alone or in combination, and paraquat/diquat. The addition of 2,4-D to paraquat improves the kill slightly but causes severe clover yield reductions. The ratios of grass and clover in the trials were least affected by paraquat/diquat mixtures.

Sulphate of ammonia and nitro-lime failed to permanently reduce daisy populations. Because of the known scorching properties of these nitrogenous fertilisers,

it was expected that they would reduce daisy leaf area, and that regrowth would be smothered by accelerated pasture growth.

Nitrogen aids pasture recovery following spraying and while it tends to reduce clover yields, this reduction is usually only temporary. In sulphur deficient soils clover responds well to sulphur which is present in sulphate of ammonia but there was no evidence from soil tests of S deficiency nor was there any DM response to S apparent in this series of trials.

Complete eradication of daisies at one spraying does not appear to be possible and a small nucleus of daisies always remains. This may be partly due to dung, dirt etc. protecting the leaves. This may have contributed to a reduction in control in these trials but the monitoring of treatment effect was not sufficient to indicate how important this may have been.

Future work will be aimed at firstly reducing the daisy population by herbicidal spraying and applying nitrogen, then attempting to slow down or prevent rapid re-infestation by either of these means. Times of application in October and November will also be investigated.

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