CHEMICAL CONTROL OF DAISIES IN OTAGO/SOUTHLAND PASTURES

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SUMMARY

The chemical control of daisies (*Bellis perennis*) was studied in Otago/Southland pastures. 2,4-D reduced daisy incidence though not to an acceptable low level. 3,6-dichloropicolinic acid (3,6-DCPA) gave good control but was unacceptable because of severe clover damage. Sward destruction chemicals were tested in a pasture renovation trial; glyphosate gave poor control and though paraquat was better the addition of 2,4-D was necessary for good control. MCPA, 2,4-DB and bentazone were ineffective for daisy control in newly sown pasture.

INTRODUCTION

Daisies are one of the main pasture weeds in South Otago/Southland (P.J. Hook pers comm). This weed invades at an early stage following pasture renewal, and it is not unusual to see frequent flower heads in the spring following sowing. These new plants most probably arise from buried seed; Champness and Morris (1948) found up to eleven million buried viable daisy seeds per acre when studying soils under pasture in England.

Daisies are one of the pasture species most resistant to trampling, and most authorities consider them weeds of short pasture (Salisbury 1961). They appear to be one of the few non-grass weeds able to persist in the intensively stocked all-grass farms now common in this area. Whether a change in the timing or frequency of grazing may inhibit undesirable population levels of this weed, their effect on pasture production and how much they contribute to animal diet has not yet been determined.

Published reports of chemical control of daisies relate largely to work in lawns and sports turf; these will not be discussed here as the environment and management are not typical of grazed pastures. Furthermore the herbicides usually giving successful control are known to adversely affect clovers. Clover damage is unacceptable in Otago/Southland pastures as it has been shown to depress fat lamb production (Lewis 1956, 1957).

Few references to control in pasture are available, and none refer to clover selective herbicides. Holly (1949) found multiple application of MCPA (1 kg x 3) better than a single application (3 kg x 1) with up to 99% control from three applications of 2-4 kg/ha. Zonderwijk (1955) found 2,4-D more effective than MCPA, particularly in mid summer.

This report concerns herbicide investigations in both recent and established pasture, and the effect on daisies of herbicide mixtures used for pasture renovation.

METHOD

Field trials were laid down at various sites in Otago/Southland using plot sizes of 1.5 x 10 m, with treatments replicated 4 to 6 times in randomised blocks. The pasture used consisted predominantly of white clover (*Trifolium repens*) and perennial ryegrass (*Lolium perenne*) rotationally grazed by sheep for 12 months of the year. The effect on daisies of chemicals used for pasture renovation was tested in one trial at Milton.

All herbicides (see Tables 1 and 2) were applied by modified Oxford Precision sprayer in 250 litres /ha in calm fine weather conditions, to pasture 2 to 5 cm high.

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Following a withholding period of 5 to 14 days, all trial areas were grazed in accordance with current farm practice.

Daisy populations were measured as percentage cover in 5 x 225 cm² quadrats per plot, or by point analysis at 200 points/plot. Mean data for three or four replicates are reported.

RESULTS

Control in new pasture

Pasture sown at Waikaka in autumn was sprayed (24.10.79) the following spring with chemicals to which white clover is tolerant. 2,4-DB, MCPB and bentazone, were ineffective at 1.0 kg/ha when observed 9 months after application.

Control in established pasture

The effect on daisies of herbicides with and without 2,4-D (sprayed 1.12.78 at Waikaka) are shown in Table 1. Only minor reductions were obtained with 2,4-D, whereas addition of the latter improved control though not to an acceptable level.

Inconclusive results were obtained at two other sites at Winton and Milton where both amine and ester formulations of 2,4-D, 0.75 to 1.5 kg/ha were applied 30.11.78 and 7.12.78 for daisy control.

TABLE 1: The effect of herbicides on daisies in established pasture, sprayed 1.12.78.

Treatment kg/ha	Daisies	
	% cover at 17.2.79	hits/100 points at 24.10.79
mecoprop 1.0	58	52
mecoprop 1.0 + 2,4-D amine 0.75	35	35
2,4-DB 1.0	63	54
2,4-DB 1.0 + 2,4-D amine 0.75	52	39
MCPB 1.0	69	52
MCPB 1.0 + 2,4-D amine 0.75	49	38
MCPA 0.5	62	54
MCPA 0.5 + 2,4-D amine 0.75	46	37
bentazon 1.0	55	47
bentazon 1.0 + 2,4-D amine 0.75	51	41
2,4-D amine 0.75	52	43
untreated	71	53
untreated	70	57
CV%	6.7	9.2
LSD 5%	5	12
LSD 1%	7	17

The introduction of 3,6-DCPA for control of composite weeds suggested that it should be evaluated for daisy control in pasture. In a single trial at Waikaka (sprayed 8.5.80) daisy incidence was lowered, but at the expense of severe and long lasting reductions in white clover (Table 2).

The effect of chemical pasture renovation treatments on daisies

Where pasture has deteriorated through invasion of weedy grasses and herbs and productivity is low, renovation is sometimes carried out by the application of herbicides to kill or suppress existing vegetation during the establishment phase of new pasture species over-drilled soon after spraying.

The effect of this technique on an established daisy population of 11% ground cover was measured following application (26.1.79) of paraquat and glyphosate both alone and in mixtures with 2,4-D. The results (Table 3) indicate that the greatest reduction in daisy numbers occurred at the minimum rate of paraquat and maximum rate of 2,4-D, although this result was not significantly different from most other treatments including 2,4-D. Analysis of the main effects in this trial, showed that daisy

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TABLE 2: The effect of 3,6-DCPA (g/ha) and other herbicides (kg/ha) on daisies in established pasture, and the effect on white clover (sprayed 8.5.80)

3,6-DCPA	plus	hits/100 points		
		23.10.80	16.1.81	
		daisies	clover	clover
15		10	2	12
30		8	nil	2
15	MCPB 0.5	18	11	46
30	MCPB 1.0	11	2	20
15	2,4-DB 0.75	5	2	12
30	2,4-DB 1.5	3	trace	3
nil	2,4-D 0.75	11	15	50
nil	2,4-D 1.0	6	10	40
15	2,4-D 0.75	4	5	21
15	2,4-D 1.0	4	1	10
30	2,4-D 0.75	3	trace	1
30	2,4-D 1.0	1	trace	1
untreated		27	18	52
untreated		28	18	57
CV %		31	48	29
LSD 5%		4	4	10
LSD 1%		6	5	13

TABLE 3: The effect of pasture destruction sprays on an established daisy population. Sprayed 26.1.79, sown 29.1.79.

Treatment kg/ha	Daisies		
	% cover	hits/100 points	
	15.8.79	6.11.79	18.9.80
paraquat 0.3	3.3	6.0	2.7
paraquat 0.6	3.1	8.7	5.0
paraquat 0.9	4.0	11.7	3.0
paraquat 0.3 + 2,4-D amine 0.75	2.2	5.0	1.6
paraquat 0.6 + 2,4-D amine 0.75	5.2	8.0	3.7
paraquat 0.9 + 2,4-D amine 0.75	4.8	9.5	3.3
paraquat 0.3 + 2,4-D amine 1.5	1.1	2.2	1.3
paraquat 0.6 + 2,4-D amine 1.5	2.9	7.8	2.7
paraquat 0.9 + 2,4-D amine 1.5	2.5	9	3.3
glyphosate 0.36	5.3	12.3	3.3
glyphosate 0.72	4.8	9.8	4.0
glyphosate 1.08	10.9	14.2	4.7
glyphosate 0.36 + 2,4-D amine 0.75	1.9	6.7	1.7
glyphosate 0.72 + 2,4-D amine 0.75	5.5	7.8	3.0
untreated	6.3	10.3	3.0
CV %	46	38	74
LSD 5%	3.3	5.4	3.9
LSD 1%	4.4	7.4	5.2

control was better with paraquat at 0.3 kg/ha rather than at 0.6 and 0.9 kg/ha ($P \leq 0.05$). There was no significant difference between 2,4-D at 0.75 and 1.5 kg/ha while paraquat gave better control than glyphosphate at all rates ($P \leq 0.05$).

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DISCUSSION

In this study only 2,4-D and 3,6-DCPA have been shown to have any appreciable effect on daisy populations. The latter is, however, unacceptable because of the severe damage it would cause to the essential white clover component of high producing New Zealand pastures.

An attempt to study 2,4-D in more detail failed through a collapse in daisy populations, perhaps caused by a succession of two very good years for pasture growth with the consequent taller pasture suppressing the more prostrate daisy. However, even if acceptable control had been achieved with 2,4-D, the benefit of this would have to be balanced against the known effect of 2,4-D on lamb growth rates through its adverse effects on clover production (Lewis 1956, 1957).

No useful effect on daisies in recently established young pasture was shown by herbicides known to have little effect on clover, thus agronomic procedures such as higher seeding rates, silage cuts, and grazing management will have to be studied. Where daisies form a weed component of pasture due to be renovated, the application of glyphosate and to a lesser extent paraquat, may aggravate the situation, and it would appear advisable to reduce paraquat rates to the minimum while increasing the rate of 2,4-D if a high degree of daisy control is to be achieved. However, this may conflict with herbicide recommendations for pasture renovation resulting in failure to establish pasture.

More ecological studies need to be carried out on daisies in clover-rich pastures intensively grazed by sheep, before further attempts at chemical control are warranted.

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