Research Note

CULTIVATION AND CHEMICALS FOR WEED CONTROL IN ESTABLISHED LUCERNE

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Summary

Surface cultivation as a method of weed control in established lucerne was compared with a standard chemical treatment (not cultivated) at three sites: trifluralin was included with some cultivation treatments to reduce weed seedling re-infestation. Cultivation reduced weed content, but the effects on lucerne production were largely negative. Chemical treatment in general was more efficient. Because of poor germination conditions, the effect of trifluralin was not tested.

INTRODUCTION

SURFACE CULTIVATION, once the only method available for control of weeds in established lucerne, has been largely superseded by chemical weedkillers. Surprisingly it is difficult to obtain data on comparisons of the two methods in New Zealand; thus, a small project was carried out in Central Otago to establish in terms of dry matter yield and plant population whether cultivation has any value for weed control in established lucerne. To test whether prevention of weed seedling re-establishment is the key to success with this method, a treatment incorporating trifluralin, a part-residual herbicide non-phytotoxic to established plants, was included.

A standard chemical treatment (atrazine/2,2-DPA) was included for comparison with cultivation.

MATERIALS AND METHOD

Established lucerne at three sites, (1) Oturehua, (2) Tarras, and (3) Bendigo, was cultivated and sprayed on September 9, 8 and 8, 1970, respectively.

It was not practicable to use the same implement for cultivation at all sites, and the following implements were used: Site 1, discs; Site 2, rigid tine cultivator with "lucerne" points; and Site 3, spring tine harrows (Kvernland model).

Weed cover at the time of application on Site 1 consisted mainly of poa pratensis (*Poa pratensis*) with some barley grass (*Hordeum* sp.) 1.2 to 2.5 cm high and 60% of total cover. On Site 2 the main weeds were bromus tectorum (*Bromus tectorum*), poa pratensis, daisy (*Bellis perennis*), and occasional barley grass, 1.2 to 3.7 cm high and 20% of total cover. At Site 3 there were a few small flatweeds. All sites were close-grazed at this time.

Six treatments as listed in Table 1 were laid down in a randomized block of 4 replicates. Application of herbicides was carried out in 250 l water/ha, immediately before cultivation. Grazing was restricted, and each trial cut for dry matter yields on November 24, 1970.

Dissection of yield into species components was not possible, and pure lucerne yields were estimated by adjusting for percentage weed cover from an assessment prior to cutting.

The effect of treatments on lucerne population was estimated by plant numbers per linear metre taken twenty times at random in each plot (80 metres total) on October 1, 1971.

RESULTS

The three methods of cultivation cannot be compared directly because of site differences. However, spring tine harrows appeared to be better in that a fine tilth was produced with apparently only minor damage to the lucerne.

Both discs and cultivator produced a rough tilth, mainly because the soil was held together by root debris from weeds. The operation appeared rather inefficient because, in spite of two passes each in opposite directions with these machines, not all weeds were seen to be uprooted. This was confirmed by an estimation of weed cover at harvest (Table 1) showing that weeds were not eradicated by cultivation treatments although significant reductions were generally achieved.

Discs and cultivator appeared to cause more damage to the lucerne, but considerable regrowth from damaged crowns must have occurred, as indicated by the lack of differences in lucerne plant numbers one year later (Table 1).

Cultivation reduced yields at all sites, the addition of trifluralin had no significant effect, while the application of atrazine/2,2-DPA had no significant effect on yields in relation to control yields, but was significantly higher than cultivation treatments at Site 1, and at Site 2 in the case of one cultivation treatment including the highest rate of trifluralin.

No cultivation treatment increased pure lucerne yield. However, probable increases were indicated by atrazine/2,2-DPA.

DISCUSSION

Methods of cultivation cannot be compared because there was no on-site comparison. However, observations suggested that spring tine harrows were less damaging to lucerne crowns than cultivator or discs.

The main effects of (a) cultivation and (b) chemicals can be considered separately and the results compared at each site.

(a) EFFECT OF CULTIVATION ON:

Total yield: for Site 1 the reduction from 1420 kg to 770 kg/ha is a highly significant reduction of 46%.

For Sites 2 and 3 the reductions, though still there, are less spectacular and fail to attain significance when taken separately.

Analysis of the combined yields of the three sites (following a correction to the yields at Site 3 by applying a weighting coefficient of one-third, since the standard deviation of individual plot yields is three times as great as for Sites 1 and 2, gave the weighted average yields of 1657 and 2069 kg/ha for cultivated and not cultivated, respectively. The drop of 19.9% is more than three times its standard error (6.07%), and therefore cultivation effects over all sites were highly significant.

TABLE 1: EFFECT OF TREATMENT ON YIELD, WEED COVER, AND LUCERNE POPULATION

Mean	*Cultivated*				*Not cultivated*		*CV %*
	1. Untreated	*2. trifluralin 1.1 kg/ha*	*3. trifluralin 1.7 kg/ha*	*4. trifluralin 2.2 kg/ha*	*5. atrazine 0.9/ 2,2-DPA 1.7 kg/ha*	*6. Untreated*	
Total yield DM kg/ha:							
Site 1	770 bBC	510 bC	570 bC	590 bC	1270 aAB	1420 aA	30.2
Site 2	1330 abA	1370 abA	1270 abA	1140 bA	1570 aA	1570 aA	16.5
Site 3	5300 a	5300 a	5200 a	5200 a	5780 a	5510 a	12.9
% Weed Cover at harvest:							
Site 1	19 bB	16 bB	16 bB	19 bB	16 bB	37 aA	38
Site 2	19abAB	16 bAB	12 bB	13 bB	Tr. cC	28 aA	44
Site 3	(Not assessed, only few flatweeds present)						
Estimated pure lucerne yield (DM kg/ha)							
Site 1	620	430	480	480	1070	890	
Site 2	1080	1150	1040	990	1570	1130	
Site 3	5300	5300	5200	5200	5780	5510	
Lucerne plants per 80 m							
Site 1	170 a	155 a	160 a	158 a	174 a	146 a	13
Site 2	159 a	167 a	156 a	155 a	168 a	152 a	16
Site 3	190 a	182 a	180 a	182 a	186 a	187 a	11.7

Weed cover:

Site 1 a highly significant reduction resulted.
Site 2 a possible reduction (non-significant).
Site 3 not measured through lack of weed infestation.

Estimated pure lucerne yield:

Site 1 probable reduction.
Site 2 little or no reduction.
Site 3 little or no reduction.

Lucerne plant population:

Nil effect at all three sites.

(b) EFFECT OF CHEMICALS

atrazine/2,2-DPA

Total yield: No effect at any site.
Weed cover: Reduced weed cover at both Sites 1 and 2 where weeds were important.
Pure lucerne yield: Increases probable at both Sites 1 and 2.
Plant population: No effect at any site.

trifluralin

No effect on yield, weed cover or plant population. No dose effect.

CONCLUSIONS

Cultivation reduced weeds to some extent but either lowered or failed to improve yields, while chemical control (atrazine/2,2-DPA) increased estimated pure lucerne yields without affecting total production.

Atrazine/2,2-DPA appeared better than cultivation in increasing estimated pure lucerne production.

The control of weed seedlings by addition of trifluralin did not appear important. However, climatic conditions were such over the trial period that few or no weeds seeds germinated, yet where cultivation is still relied upon for weed control in established lucerne, the addition of a residual herbicide such as trifluralin would appear wise.

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