Lucerne

LUCERNE: CHEMICAL WEED CONTROL OF THE MAJOR COMMON WEEDS

I. C. LOGAN and R. N. ARNST
ICI New Zealand Limited, Christchurch

Summary

A series of trials to investigate the control of the common weeds of lucerne (*Medicago sativa*) was conducted in Canterbury and Central Otago. Main weeds encountered were storksbill (*Erodium* spp.), shepherd's purse (*Capsella bursa-pastoris*), chickweed (*Stellaria media* and *Cerastium* spp) and barley grass (*Hordeum* spp). A mixture of paraquat and simazine was superior, both in weed control and crop yield, to one of 2,2-DPA and atrazine which was in turn superior to carbetamide, pronamide and terbacil.

INTRODUCTION

THE work reviewed in this paper was conducted in the belief that weed free lucerne is desirable. Factors which contribute to this assumption are the necessity to maintain the maximum number of lucerne plants per area so that full production is achieved when expected, and the preference for vegetation of uniform moisture content to ensure ease of harvesting and good quality hay.

Due to the extent of work conducted over the past years, only a summary, of a number of trials conducted in 1970-71 on common weeds of lucerne, can be given here. In addition 2 trials covering different circumstances or conditions are presented in more detail.

EXPERIMENTAL METHOD AND RESULTS

a. General

Trials were conducted with fully replicated and randomised designs. Plot sizes were 2.5 m x 10 m or longer and chemicals were applied in water volumes between 280 and 400 litres/ha. Time of application was as close as possible to normal application times for the particular district.

Trials were situated throughout Canterbury and Central Otago and included irrigated and non-irrigated crops.

At the time of spraying estimates of plant population were made, usually by point analysis. Counts showed that the average weed population encountered in the trials was as in column A of Table 1.

Figures from lucerne and weed production, as shown in Tables 2 and 3 represent yields as at the first cut for a hay crop.

Green material collected at harvest was dissected and dried and column B of Table 1 shows the percentage of dry matter contributed by each species to the total weed dry matter as taken from chemically untreated areas.

Lucerne

Five of the above trials did include other herbicides and results from these are shown in Table 3.

TABLE 1: WEED SPECIES — AVERAGE POPULATIONS

Weed	% of Weed Population	
	A (pre-spray)	B (harvest)
storksbill	41.6	34.4
shepherd's purse	21.1	9.8
chickweed	15.7	5.1
clover	2.2	
other flat weeds	3.2	10.8
barley grass	7.3	28.2
other grasses	9.0	14.1

TABLE 2: MEANS OF YIELDS FROM 8 TRIALS

Treatment (kg/ha)	kg DM/ha		% of untreated	
	lucerne	weeds	lucerne	weeds
untreated	2634	1074	100	100
paraquat 0.6/simazine 0.75	3352	180	127	17
2,2-DPA 1.5/atrazine 0.8	2931	375	111	35

TABLE 3: MEANS OF YIELDS FROM 5 TRIALS

Treatment (kg/ha)	kg DM/ha		% of untreated	
	lucerne	weeds	lucerne	weeds
untreated	2584	1464	100	100
paraquat 0.6/simazine 0.75	3415	237	132	16
2,2-DPA 1.5/atrazine 0.8	3054	444	118	30
pronamide 0.5	2663	926	103	63
pronamide 1.0	2858	558	111	38
pronamide 1.0/atrazine 1.2	2851	137	110	9
terbacil 0.8	2522	938	98	64
carbetamide 3.6	*	*	104	25
paraquat 0.3/carbetamide 3.6	*	*	131	16

* only 4 trials

Paraquat/simazine mixtures generally controlled the common weeds but left clovers (*Trifolium* spp), yarrow (*Achillea millefolium*), dandelion (*Taraxacum officinale*), ryegrass (*Lolium perenne*) and in 1 case a very heavy infestation of poa pratensis (*Poa pratensis*) which accounted for two-thirds of the paraquat/simazine weed yield.

2,2-DPA/atrazine did not give satisfactory results on storksbill (*Erodium* spp.) but checked other weeds, except for yarrow and dandelion, in time to allow satisfactory harvesting.

Pronamide was somewhat unpredictable but at best took out only the grasses, having no effect on flat weeds, particularly shepherd's purse (*Cap-*

Lucerne

sella bursa-pastoris). The addition of atrazine did help overcome this problem by harvest time but did not appear to increase lucerne yield.

Carbetamide was also variable in results but did apparently have some effect on shepherd's purse as well as grasses. The addition of paraquat greatly increased the weed spectrum controlled.

Terbacil appeared to be either very effective or inactive. However, no matter what the weed result it did appear to be detrimental to lucerne growth.

b. Trial A

A trial at Pateoroa in Central Otago was situated in a paddock which was subject to flood irrigation and it was thus possible to take 4 cuts from the trial and ascertain the overall season effect of weed control on a high producing crop.

The trial area was on a Linburn Brown Grey earth and the plots were replicated 3 times in a randomised block. Chemicals were applied on 12th August, 1970, and a point analysis on the day of spraying revealed the following percentage contribution of species comprising the weed population:

chickweed		25
shepherd's purse		21
storksbill		14
barley grass		13
poa pratensis		9
Other species including poa annua (<i>Poa annua</i>), browntop (<i>Agrostis tenuis</i>), docks (<i>Rumex</i> spp) and thistles		13

Cuts for dry matter and herbage analysis were taken 4 times and the results are shown in Table 4.

TABLE 4: DRY MATTER YIELDS — TRIAL A

Treatment (kg/ha)	First cut		kg DM/ha Fourth cut		Total	
	lucerne	weeds	lucerne	weeds	lucerne	weeds
untreated	3738	585	1351	630	9412	1753
paraquat 0.6/simazine 0.75	4182	0	1777	125	11446	129
paraquat 0.6/simazine 1.5	4090	0	2210	68	11932	105
2,2-DPA 1.5/atrazine 0.8	3040	286	1991	59	9850	524

At the first cut the majority of weed in the untreated area consisted of barley grass, storksbill and shepherd's purse. Storksbill was the predominant weed in the 2,2-DPA/atrazine treated areas.

By the time the fourth cut was taken the major part of the weeds on the untreated area consisted of grasses — over half being barley grass — with flatweed seedlings just appearing. It was noted at this stage that the dense mat of barley grass was stunting lucerne growth. Grasses were also appearing in treated areas but storksbill was the major component on 2,2-DPA plots whereas clovers, docks and poa pratensis made up the paraquat/simazine weed population.

Lucerne

c. Trial B

Following the introduction of a new breed of grass killers a trial was established in a crop which had a weed population mainly of grasses. The crop was situated near Culverden in North Canterbury on a Barrhill soil type.

The plots were arranged in a randomised block and replicated 5 times. The trial was sprayed on 26th July 1971, at which time point analysis showed:

	%		%
lucerne	32.0	perennial ryegrass	3.3
barley grass	14.6	<i>Geranium</i> spp	8.0
chewings fescue (<i>Festuca</i>		chickweed	6.6
<i>rubra</i> ssp <i>commutata</i>)	12.0	shepherd's purse	4.6
poa annua	8.0	dandelion	4.0
poa pratensis	4.6	yarrow	4.6

A cut was taken on 23rd November and the dry matter results are shown in Table 5.

TABLE 5: DRY MATTER YIELDS — TRIAL B

Treatment kg/ha	kg DM/ha	
	Lucerne	weeds
untreated	3376	1030
paraquat 0.6/simazine 0.75	3936	104
carbetamide 3.6	3133	682
carbetamide 3.6/paraquat 0.3	3889	123
pronamide 0.5	3215	335
pronamide 1.0	3733	888
terbacil 0.8	3304	918
2,2-DPA 1.5/atrazine 0.8	3634	152

Despite being fairly inconspicuous at the time of spraying, shepherd's purse grew vigorously until at harvest it contributed almost half the dry matter yield from the untreated areas. The flush of growth by this weed was also apparent on the pronamide plots but was absent from all other treatments.

Chewings fescue was eliminated by only carbetamide; pronamide gave greater than 75% control; paraquat/simazine, 2,2-DPA/atrazine gave 50% control; but terbacil apparently had no effect.

Ryegrass was satisfactorily controlled by all treatments except carbetamide which had only 50% success. Poa pratensis, in this competitive situation, was controlled by all treatments except the low rate of pronamide.

By the time the cut was made yarrow had made vigorous growth in most treatments but particularly in the carbetamide and terbacil plots.

DISCUSSION

The series of trials reviewed indicate that the mixture of paraquat/simazine is most reliable for controlling the major common weeds of lucerne whilst giving a worthwhile increase in lucerne production. The

Lucerne

combination of 2,2-DPA/atrazine will clear up most of the weeds except storksbill by the time of the first cut, but lucerne yield is not usually as high as with the paraquat mix.

It is considered that the yield discrepancy between the 2 mixtures is largely due to the rapid knockdown effect of the paraquat which quickly removes the choking effects of poa annua, barley grass and chickweed thereby allowing free development of the lucerne at the beginning of the growth period. This early desiccation of plants also has the advantage that it prevents the formation of seed heads, particularly of barley grass and storksbill, which helps reduce reinfestation (Logan and Arnst 1972).

The same disadvantage may be cited for the other chemicals and also their weed control spectrum is usually poorer than that of 2,2-DPA/atrazine. It may be argued that these chemicals should be applied earlier but, in most lucerne districts, this is not practicable and, if carbetamide and pronamide do in fact have short residual activity, this would allow a spring germination of weeds.

The addition of paraquat to carbetamide can improve its effectiveness but residual properties are limited. However the mixture could be useful where there are particular grass problems.

Subterranean-clover (*Trifolium subterraneum*) has not featured greatly in the trials quoted but if this, or other clovers, are abundant then substituting atrazine for simazine with paraquat gives a satisfactory result. Atrazine, however, does not appear to have the long term, that is through to autumn, residual control that can often be achieved with simazine.

Loss of total dry matter production is oft quoted as a detrimental feature of chemical weed control in lucerne. However, it is felt that the dry matter production of weeds as quoted in trials figures would not be available for hay production. Many of the weeds observed and collected during trials assessments would be lost during normal haymaking processes, due to their dry fragile state. Others would be too wet and would hamper good haymaking practices. Good weed control also prevents the further distribution of seeds when hay is fed out.

In the grazing situation it is necessary to discourage the formation of particularly noxious seedheads, such as storksbill and barley grass, in order to alleviate the adverse effects on pelts and grazing intensity as noted by Grant and Rumball (1971), and Atkinson and Hartley (1972).

Lucerne is the crop and competition must be damaging to population and detrimental to production.

ACKNOWLEDGEMENTS

The authors would like to record their gratitude to the many farmers who have co-operated throughout the trials programme.

REFERENCES

- Atkinson and Hartley 1972. Damage caused to lambs by barley grass. *Proc. 25th N.Z. Weed & Pest Control Conf.*: 29.
- Grant and Rumball 1971. The ecology and control of barley grass: a review. *Proc. 24th N.Z. Weed & Pest Control Conf.*: 63.
- Logan and Arnst 1972. Barley grass control: evaluation of initial and sequential applications of herbicide mixtures. *Proc. 25th N.Z. Weed & Pest Control Conf.*: 34.