ANNUAL WEEDS IN ESTABLISHED LUCERNE

T. P. PALMER

*Crop Research Division, DSIR, Christchurch**Summary*

Lucerne (*Medicago sativa*) was sprayed with paraquat in winter, or oversown with 'Tama' ryegrass (*Lolium multiflorum*), to control annual weeds, principally storksbill (*Erodium* spp). In one newly established lucerne stand and in one irrigated trial, controlling storksbill increased subsequent lucerne yields. In other trials eliminating annual weeds reduced total yield of herbage and did not increase lucerne yield. 'Tama' reduced weeds in some trials and sometimes increased total herbage yield. These results are generally consistent with other published work. The inference is that in dry areas, weeds do not compete successfully with lucerne for moisture.

INTRODUCTION

Winter annual weeds including barley grass (*Hordeum* spp), storksbill (*Erodium* spp) shepherds purse (*Capsella bursa-pastoris*), and poa annua (*Poa annua*) commonly invade lucerne (*Medicago sativa*) in autumn, grow through the winter when moisture is not limiting, and either die after they seed, are smothered by growing lucerne, or cannot compete for reduced moisture supplies in spring. Storksbill establishes in seedling lucerne in wet summers and continues through to the next spring.

Most of these weeds produce significant amounts of palatable, high quality forage but storksbill and barley grass have fruits which damage wool and pelts. They reduce the value of hay, and storksbill has thick stems which dry slowly after cutting.

The effect of controlling these weeds on production of weeds and lucerne, and the relationship between density and weed invasion, were examined in five trials at Lincoln.

METHODS

Weed control treatments were superimposed across sowing rate x cultivar treatments in trials on a Templeton silt loam at Lincoln. Paraquat was sprayed at 0.55 kg/ha in 280 litres of water. All the lucerne stands were high producing, giving 13000 kgDM/ha or more, and were fertilised annually with 200 kg/ha superphosphate.

Results are presented from the harvests immediately following treatment, and for other post-treatment harvests when effects persisted. Trials were harvested at the hay stage in the intervening periods. Botanical composition was determined by botanical analysis of 500 g of green herbage from each plot when weeds were estimated to be 10% or more of the total herbage.

The winter after sowing (1969), paraquat was sprayed on trial 1 on 19 June (6 replications), and grazed plots were grazed bare from 3-14 July. In 1972 'Tama' ryegrass (*Lolium multiflorum*) was drilled at 20 kg/ha on 10 February, and was sprayed with paraquat on 6 July (12 replications). In 1973, one treatment (2 replications) was irrigated to field capacity on 7 and 22 March. 'Tama' was drilled at 30 kg/ha on 9 March (12 replications). The whole trial was grazed bare on 15-16

Proc. 29th N.Z. Weed and Pest Control Conf.

Lucerne

March, and on 25 June half of each irrigated plot was harvested and recorded (72 replications). Paraquat was sprayed on 13 July (12 replications). In 1974 'Tama' was drilled at 20 kg/ha on 15 March, and paraquat was sprayed on 26 June (12 replications). 'Tama', paraquat and control treatments were on the same sites from 1972 to 1974.

Trial 2 was sprayed with paraquat in the winter after sowing on 15 June (4 replications).

In trial 3, 'Tama' was drilled at 20 kg/ha on 1 March 1971 (9 replications), and sprayed with paraquat 26 June 1974 (8 replications).

RESULTS

In all cases paraquat eliminated winter annual weeds. Results of treating storks-bill-infested lucerne in the winter after sowing are shown in Table 2.

TABLE 1: TRIAL TREATMENTS

Trial 1	Dec. 1968 sown	1969 paraquat grazed	1972 paraquat 'Tama'	1973 paraquat 'Tama' irrigated mid-winter cut	1974 paraquat
Trial 2	Nov. 1970 sown	6.71 paraquat			
Trial 3	Oct. 1966 sown	1971 'Tama'	1974 paraquat		
Trial 4	Oct. 1968 planted	Plant spacing treatments.			
Trial 5	Oct. 1970 planted	35 x 35, 18 x 18, 18 x 9, 18 x 4.5 cm			

TABLE 2: YIELD OF CONTROL (kgDM/ha), AND PARAQUAT AND GRAZED AS PERCENTAGE OF CONTROL IN ONE YEAR OLD LUCERNE

	Trial 1			Trial 2		
Lucerne yields	10.69	11.69	1.70	9.71	11.71	1.72
control	1350	1610	2040	1840	3830	1790
paraquat	119	92	100	135*	125*	115*
grazed	75*					
Weed yields						
control	1980	390	0	2750	0	0
grazed	30*					

* Significantly different from control $P < .01$

Eliminating storks-bill with paraquat in the winter after sowing improved lucerne yield. In one trial the effect was non-significant and short lived, in the other trial lucerne production was significantly higher from treated plots for the three harvests following treatment. Total herbage yield was reduced by spraying. Hard grazing in the winter reduced subsequent lucerne yield and weed yield significantly.

Results of treatment on older lucerne are shown in Table 3.

Paraquat increased yield of lucerne in trial 1 which was irrigated in the autumn and left without cutting to the following September. In four other cases it did not affect lucerne yield, and in one reduced it significantly. In all cases total herbage yield was reduced.

Lucerne

TABLE 3: YIELD OF CONTROL (kgDM/ha) AND PARAQUAT AND 'TAMA' RYEGRASS AS PERCENTAGE OF CONTROL OF OLD LUCERNE.

	10.72	Trial 1		Trial 3			
		Dry	Irrigated				
		9.73	6.73 +9.73	9.73	9.74	8.71	9.74
Lucerne yield							
control	1690	440	6980	3620	2500	2880	2440
paraquat	90	98	101	114*	67*	—	104
'Tama'	81*	94	100	93	85*	84*	
Weed yields							
control	0	720	1160	2400	440	570	610
'Tama'	0	71*	47*	85	60*	65*	
'Tama' yield	280	930	600	2160	600	1210	

* Significantly different from control $P < .01$

'Tama' reduced lucerne yield significantly in three cases out of six, reduced weed yield significantly in four cases, and increased total herbage yield.

Table 4 shows results from plantings at various densities.

TABLE 4: YIELDS OF LUCERNE AND WEEDS FROM DIFFERENT LUCERNE PLANT DENSITIES

	Trial 4			Trial 5			
	10.69	9.73	2.71	9.71	10.73	5.74	9.74
spacing							
Lucerne yields							
35 x 35 cm	2620	750	790	1750	1680	260	1330
18 cm rows	3900	1130	2000	4050	2140	540	1700
Weed yields							
35 x 35 cm	890	160	470	700	90	130	260
18 cm rows	80	170	200	400	40	70	150

Spacings 18 x 18 cm and closer were not significantly different from one another, and their mean is given in Table 4. Lucerne at 35 x 35 cm yielded less than in 18 cm rows in winter-spring cuts, and in the summer of the establishment year. In later years summer production was the same for all treatments. The weed production was greater in the sparser lucerne. Couch (*Agropyron repens*) and yarrow (*Achillea millefolium*) invaded only the 35 x 35 cm lucerne.

DISCUSSION

Eliminating dense storksbill from lucerne stands in the winter following sowing decreased total herbage production, but resulted in greater lucerne production during the following spring in one trial. In established lucerne, spraying with paraquat reduced total herbage yield in subsequent harvests, and in some cases reduced lucerne yield. Sowing 'Tama' in dense lucerne reduced weed yield and lucerne yield slightly, and had little effect on total yield. In a less dense stand, 'Tama' increased total yield.

Lucerne

In lucerne planted at several densities, there were more weeds in the least dense population which did not contain enough plants to give maximum production. Weed seedlings did not become established in the denser stands in dry autumns.

These results are generally consistent with those of other workers. Leonard (1964) increased lucerne yield by spraying the winter after sowing, but in older stands there were reductions in total herbage yield, a marked increase in lucerne yield in one trial, and no effect in another. Atkinson and Douch (1973) did not find any crop response from weed control. Logan and Arnst (1973) recorded reductions in total production and increases in lucerne production. Rae and Patterson (1973) found large responses in trials in Waikato, but not in Otago and Canterbury, and Honore *et al* (1973) obtained responses in Northland. Forgie (1973) obtained a large lucerne response in a stand of unstated age. Elimination of weeds did not increase total herbage production in any of the above trials; in several cases total production was reduced substantially.

In dry areas, annual weeds, and most perennial weeds cannot compete for moisture with lucerne, and lucerne stands purge themselves of weeds in dry seasons. In wetter areas where there is usually enough moisture for weeds to co-exist with lucerne, management should aim at eliminating weeds by shading. During the period of winter dormancy of lucerne this is not possible, and herbicides or annual grasses or cereals may be needed to keep lucerne weed-free, if this is desirable.

REFERENCES

- Atkinson, G. C., and Douch, G. A., 1973. Weed free lucerne in pumice country. *Proc. 26th N.Z. Weed and Pest Control Conf.*: 54.
- Forgie, C. D., 1973. Atrazine formulations for weed control in established lucerne. *Proc. 26th N.Z. Weed and Pest Control Conf.*: 74.
- Honore, E. N., McMeiken, W. B., and Cumberland, G. L. B., 1973. Lucerne weed control — results of two Northland trials. *Proc. 26th N.Z. Weed and Pest Control Conf.*: 78.
- Leonard, W. F., 1964. Paraquat on lucerne. *Proc. 17th N.Z. Weed and Pest Control Conf.*: 44.
- Logan, I. C., and Arnst, R. N., 1973 : Chemical weed control of the major common weeds. *Proc. 26th N.Z. Weed and Pest Control Conf.*: 60.
- Rae, S. J., and Patterson, T. M., 1973. Weed control in established lucerne with isobumeton. *Proc. 26th N.Z. Weed and Pest Control Conf.*: 70.