CONTROL OF RAGWORT AND NODDING THISTLE IN LUCERNE WITH HEXAZINONE

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SUMMARY

A series of trials using hexazinone at several rates and application times in both weedy and weed free lucerne (*Medicago sativa*) stands showed that mid- to late-spring applications gave good control of nodding thistle (*Carduus nutans*) and ragwort (*Senecio jacobaea*). The trials on weed free stands illustrated the suppression of lucerne production that often results when hexazinone is used at these times. However, this suppression was masked by a positive response to removal of weed competition when used in weedy stands.

INTRODUCTION

The use of hexazinone to control problem weeds in lucerne is gaining wide acceptance in New Zealand and overseas. Those not easily killed by standard treatments, such as browntop (*Agrostis tenuis*), woolly mullein (*Verbascum thapsus*), nodding thistle and white clover (*Trifolium repens*), can be readily controlled with this herbicide (James and Atkinson 1979; Dumont and Delaude 1981; Lane and Cornwell 1981). A significant increase in the yield of lucerne was usually associated with control of these weeds (Lane and Cornwell 1981).

Traditionally weed control in lucerne is practised while the crop is dormant (winter) but it has been shown that better weed control can be obtained by using hexazinone after the first or second cut in spring (Dumont and Delaude 1981). However, there have been occasional reports of damage to lucerne from spring applications, ranging from a yellowing of the stand for about 2 weeks after application to a reduction in yield of the first cut (Allen and Butler 1980; Lane and Cornwell 1981).

This paper reports on five trials which were conducted with the aim of finding the optimum time of applying hexazinone for control of two specific weeds viz. nodding thistle and ragwort, and to measure the effect of treatments on lucerne production.

MATERIALS AND METHODS

Trials 1-3 were conducted at Reporoa on Taupo sandy loam soil while Trials 4 and 5 were conducted at Hamilton on Te Rapa peaty loam and Horotiu sandy loam soils respectively.

Control of ragwort and nodding thistle was investigated in Trials 1-3 by testing several rates of hexazinone (Velpar 90% WSP) at different times of application (Tables 1 and 2). Trials 4 and 5 were carried out on weed free lucerne stands (cv Saranac and AS13R respectively) in order to determine the effect of treatments on the crop without the interference of weeds. Both trials included five rates of hexazinone and four application times (Tables 3 and 4).

All trials were of a randomised block design with four replications. Plot size varied from 7-10 x 1.5-2 m. Chemicals were applied with a CO₂ powered precision sprayer delivering 290-350 litres/ha of solution at 210 kPa.

Assessments were made by counting the number of plants per plot and by dry matter production of weeds and lucerne from a 0.6 m wide swath along the length of the plot. Regular visual assessments were also made to supplement the reported data.

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RESULTS AND DISCUSSION

Weed control

Results from Trials 1 and 2 (Table 1) show that winter applications of hexazinone did not control ragwort but the herbicidal activity was greatly increased later in the season. From visual observations it appeared that the increased activity of hexazinone was associated with the bolting of ragwort plants. Ragwort normally bolts between mid September and mid October and therefore applying the herbicide after the second lucerne cut (October/November) would give better control than after the first cut (September). In Trial 2 hexazinone was also applied at all rates on 6/1/81 but the results are not reported as by this time the ragwort was in flower and the untreated plants died naturally soon after flowering. However, all rates of hexazinone caused rapid brownoff and prevented the setting of viable seeds.

TABLE 1: Number of ragwort plants/m² on 29.1.80 and 6.1.81 for Trials 1 and 2 respectively.

Hexazinone (kg ai/ha)	Trial 1		Trial 2	
	Treatment date		Treatment date	
	26.7.79	27.11.79	23.9.80	6.11.80
0	1.73	1.47	2.15	2.60
0.5	—	—	1.25	1.55
1.0	—	—	1.90	1.10
1.5	1.27	0	0.70	0.55
2.0	1.53	0	0.65	0.35
SED	—	—	0.32	0.32
CV%	—	—	16.9	18.3

Nodding thistle (Table 2) was more readily controlled early in the season (rosette stage) than ragwort but higher rates were needed than with later applications to obtain similar levels of control. These results are similar to those obtained by Lane and Cornwell (1981) and Dumont and Delaude (1981) where problem weeds were better controlled with late spring applications. As with Trial 2, hexazinone was applied at all rates at the flowering stage (3/11/79). Control of nodding thistle was the same as for ragwort although by this stage the lucerne was severely suppressed and did not respond to the reduction in weed competition.

TABLE 2: Dry matter (kg/ha) of lucerne and nodding thistle in Trial 3 (20.12.79)

hexazinone (kg ai/ha)	7.6.79		31.7.79		25.9.79	
	Lucerne	Thistles	Lucerne	Thistles	Lucerne	Thistles
0	360	7540	130	9070	280	3780
0.5	1020	5070	920	4360	1060	1860
1.0	1390	2790	1780	920	1400	50
1.5	1580	1200	1960	160	1660	140
2.0	1810	370	2080	200	1310	0
SED	197	1250	263	370	116	730
CV%	37	56	50	64	31	67

TABLE 3: Dry matter production of lucerne (kg/ha) in Trial 4.

Treatment dates	hexazinone (kg ai/ha)	Cut 1 6.11.81	Cut 2 19.1.82	Cut 3 5.3.82	Cut 4 29.4.82
July (21.7.81)	0	2640	3200	-	-
	0.5	2630	3350	-	-
	1.0	2850	3540	-	-
	1.5	2930	3470	-	-
	2.0	2800	3510	-	-
September (25.9.81)	0	2510	3390	1700	-
	0.5	2390	3340	1650	-
	1.0	2210	3270	1620	-
	1.5	2000	3320	1660	-
	2.0	1850	3240	1600	-
December (3.12.81)	0	-	3090	1790	1160
	0.5	-	2680	1680	1140
	1.0	-	2830	1850	1210
	1.5	-	2660	1730	1250
	2.0	-	2400	1740	1240
January (22.1.82)	0	-	-	1860	1120
	0.5	-	-	1880	1210
	1.0	-	-	1720	1150
	1.5	-	-	1680	1110
	2.0	-	-	1720	1150
SED*		192	220	157	124
CV%		11.0	9.9	12.9	15.0

* within treatment dates only

- no data taken

Crop tolerance

All rates of hexazinone used in Trials 1-3 appeared to be well tolerated by lucerne although the later applications did cause a yellowing of the stand, soon after application, for about 10 days. Any effect this might have had on yield was masked by a positive response of lucerne to the reduction in weed competition. The exception was the September treatment of Trial 3 where lucerne production was reduced with 2.0 kg/ha of hexazinone.

Trials 4 and 5, conducted in weed free stands, were designed to study the production of lucerne after the application of hexazinone (Tables 3 and 4). On two occasions in these trials a significant linear suppression of lucerne yield was obtained with increasing rates of the herbicide. These were the first cut after September application in Trial 4 and the November application in Trial 5 and corresponded to a reduction of 350-400 kg DM/ha for each kg/ha of hexazinone or about 15% of the untreated yield. Although in the other spring applications there was not a significant linear yield reduction with increasing rate, lucerne production from the highest rate of hexazinone (2.0 kg/ha) was in all cases significantly less than from untreated plots. These differences had disappeared in the second and subsequent cuts. None of the winter or summer treatments significantly affected lucerne production.

These results differ from those obtained in the South Island by Allen and Butler (1980) who reported large production losses with winter applications of hexazinone although yield losses associated with spring treatment were similar in both areas.

Lane and Cornwell (1981) also recorded two instances of reduced production. Both were with spring applications and in both cases rates of hexazinone of 1.35 kg/ha and above produced significantly less lucerne than either untreated control or lower rates of hexazinone.

TABLE 4: Dry matter production of lucerne (kg/ha) in Trial 5.

Treatment dates	hexazinone (kg ai/ha)	Cut 1 4.11.81	Cut 2 21.12.81	Cut 3 26.1.82	Cut 4 12.3.82	Cut 5 26.4.82
July (21.7.81)	0	1940	2430	1970	-	-
	0.5	2200	2290	1920	-	-
	1.0	1790	2490	1990	-	-
	1.5	1650	2380	1910	-	-
	2.0	1930	2440	1950	-	-
September (25.9.81)	0	2060	2290	1610	1110	-
	0.5	1600	1940	1710	1190	-
	1.0	1620	1950	1650	1150	-
	1.5	1390	2070	1940	1310	-
	2.0	1400	1920	1940	1460	-
November (19.11.81)	0	-	2700	2290	1690	1190
	0.5	-	2540	2170	1760	1170
	1.0	-	2260	1980	1680	1070
	1.5	-	2190	2150	1770	1070
	2.0	-	1900	2060	1800	1100
January (29.1.82)	0	-	-	-	1650	1090
	0.5	-	-	-	1480	970
	1.0	-	-	-	1410	1000
	1.5	-	-	-	1740	1100
	2.0	-	-	-	1560	1140
SED*		240	150	100	110	70
CV %		19.5	9.3	7.2	10.5	8.5

* within treatment dates only

- no data taken

CONCLUSION

These trials show that both nodding thistle and ragwort in lucerne can be adequately controlled with hexazinone. The optimum rate appears to be about 1.5 kg/ha in September for nodding thistle and for ragwort the same rate in November/December. At these times some suppression of the lucerne can be expected but in most cases this will be more than compensated for by yield increase associated with lower weed competition.

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REFERENCES

- Allen, F.C. and Butler, J.H.B., 1980. Lucerne. Agricultural Research Division Annual Report 1978/79. MAF, New Zealand: 238.
- Dumont, R. and Delaude, A., 1981. Weed control trials in established lucerne. *Compte Rendu de la 11e Conference du COLUMA*. I.T.C.F. Paris: Vol. 2, 316-329. (Weed Abstracts 1982, No. 2784).
- Dumont, R. and Jan, P., 1979. Weed control trials in lucerne. *Compte Rendu de la 10e Conference du COLUMA*. I.T.C.F. Paris: 452-460. (Weed Abstracts 1981, No. 522).
- James, T.K. and Atkinson, G.C., 1979. Control of browntop in lucerne on pumice soils. *Proc. 32nd N.Z. Weed and Pest Control Conf.*: 58-61.
- Lane, P.M.S. and Cornwell, M.J., 1981. Control of certain hard to kill weed species in lucerne with hexazinone. *Proc. 34th N.Z. Weed and Pest Control Conf.*: 17-20.