

Lucerne

CONTROL OF CERTAIN HARD TO KILL WEED SPECIES IN LUCERNE WITH HEXAZINONE

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SUMMARY

Results from a series of trials using hexazinone in lucerne (*Medicago sativa*) over the spring and summer period showed that good control of nodding thistle (*Carduus nutans*), barley grass (*Hordeum murinum*), woolly mullein (*Verbascum thapsus*), browntop (*Agrostis tenuis*) and white clover (*Trifolium repens*) was achieved at rates from 0.9 — 1.5 kg/ha. Actively growing, hard grazed, established lucerne tolerated hexazinone at rates up to 2.7 kg/ha without excessive phytotoxic effects.

INTRODUCTION

Hexazinone is a herbicide with contact and soil residual activity. It has maximum effect when applied during periods of active plant growth. The continued use of paraquat plus triazine herbicides for weed control in dormant lucerne, has led to the build up of weed species not well controlled by this combination. Nodding thistle, woolly mullein and white clover are in this category, actively competing with lucerne productivity. Browntop is another and is considered severe enough to pose a serious threat to lucerne stand longevity on the North Island pumice soils (James and Atkinson 1979). With this in mind hexazinone was tested at a range of treatment rates in trials conducted from 1977 to 1980, in the major lucerne growing areas of New Zealand. This paper presents lucerne tolerance data from five trials, and hexazinone efficacy data on nodding thistle, barley grass, woolly mullein, browntop and white clover.

METHOD

All but two of the trials outlined were conducted in Canterbury on alluvial soils. Of the others, Trial 1 was conducted at Omakau in Central Otago and Trial 5 was carried out in the Reporoa area on Oruanui silty sand. In all trials the lucerne variety was Wairau. Treatments were made throughout spring and summer to actively growing lucerne, at various weed and lucerne growth stages. Two formulations of hexazinone were evaluated, the 900g/kg water soluble powder (W.S.P.) and the 250g/litre water soluble liquid.

The trials were laid in commercial lucerne stands using a modified Oxford Precision sprayer, applying 300 litres water/ha at 200 kPa, through 730-308 fan nozzles. All trials were of randomised block design, with plots measuring 10 x 2m, replicated four times.

Crop production assessments were made from 8 — 22 weeks after treatment (WAT) using both mowing and cut quadrat techniques. Herbage dissections were carried out on subsamples taken from total bulk herbage on a per plot basis. With the more erect species such as nodding thistle and woolly mullein, plants were counted on a per plot basis, both pre-and post-spraying. Visual assessments were carried out during the course of each trial to gain crop vigour and weed control data.

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RESULTS

Lucerne tolerance

Slight yellowing of lucerne foliage was observed from all treatments for up to 3 weeks after application. Observations from all trials showed that this phytotoxic effect increased in severity with an increase in hexazinone treatment rate, an increase in the amount of lucerne foliage at treatment and an increase in lucerne stress symptoms (e.g. drought). In all trials where lucerne production was recorded, other than trial 1, production in hexazinone treated plots was significantly greater than in untreated plots (Tables 1-3).

TABLE 1: Lucerne production and weed control results: Trials 1 and 2, Nodding thistle, barley grass and white clover.

Treatment Data		Trial 1		Trial 2			
Date treated		25/9/79		28/9/80			
Lucerne age and height		1 yr, 10 cm		6 yrs, 6-10 cm			
Weed growth stage		Rosette (10-20cm dia)		Rosette (5-12cm dia)		Vegetative	Vegetative
Date assessed		18/11/79 (8 WAT)**		4/12/80 (11 WAT)			
Treatment	Rate kg/ha	Lucerne production kgDM*/ha	Nodding thistles per plot	Lucerne production kgDM/ha	Nodding thistles per plot	Barley grass kgDM/ha	White clover kgDM/ha
untreated		2150 a	24.0	1130 b	97	760	700
hexazinone	0.68	2130 a	1.5	-	-	-	-
hexazinone	0.9	1930 a	0.8	3320 a	3	34	0
hexazinone	1.13	-	-	2960 a	1	26	0
hexazinone	1.35	1650 b	0	3570 a	3	8	0
hexazinone	2.7	1270 c	0	3390 a	0	0	0
CV%				13.6			

* Dry matter ** Weeks after treatment

Hexazinone applications greater than 0.9 kg/ha, made in late September to young lucerne (12 months), with light weed competition, gave a reduction in lucerne production (trial 1). Treatments in trials 2 and 5 were also applied in late September, but to older stands (3 and 6 years). There were no significant yield differences between hexazinone treatments, but all treatments produced significantly more lucerne than untreated plots. High weed pressure coupled with dry conditions, severely reduced lucerne production in the untreated plots in trial 2, and to a lesser extent in trial 5: In a second production cut, made on trial 5, 22 WAT, there was again no significant yield difference between hexazinone treatments, but there was between treated and untreated.

In trials 3 and 4, treated late October and late November, maximum lucerne production came from hexazinone rates of 1.13kg/ha (trial 3) and 1.35 — 1.5 kg/ha (trial 4). In both of these trials lucerne production was reduced at the high hexazinone rates due to phytotoxicity, and also at the low rates due to poor initial weed control but production was still greater than untreated.

In trial 4 there was no significant difference in lucerne production between the liquid formulation of hexazinone at 1.5 kg/ha and the W.S.P. formulation at 1.35 kg/ha.

Weed control

Nodding thistle

Hexazinone generally gave greater than 90% control of all nodding thistles at all rates and times of application. At 2.7 kg/ha hexazinone gave 100% control of both

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rosette and bolting nodding thistles.

Rates below 2.7 kg/ha did not give complete control until the rosettes began to bolt in November (trials 4, 7 and 8), when 0.9kg/ha was sufficient to give complete control of all growth stages. An exception was 1.35 kg/ha in October which gave good control of rosettes prior to bolting.

TABLE 2: Lucerne production and weed control results: Trials 3 and 4 Nodding thistle, barley grass and white clover.

Treatment Data		Trial 3				Trial 4			
Date treated		28/10/80				20/11/80			
Lucerne age and height		6 yrs, 2-3 cm				2 yrs, 10cm			
Weed growth stage		Rosette (10-20cm dia)		Early green seed head	Vegetative	Rosette (20 cm dia)		Green seed head	
Date assessed		6/1/81 (10 WAT)				15/1/81 (8 WAT)			
Treatment	Rate kg/ha	Lucerne prod. kgDM/ha	Nodding thistles per plot	Barley grass kgDM/ha	White clover kgDM/ha	Lucerne prod. kgDM/ha	Nodding thistles per plot	Barley grass kgDM/ha	
untreated		1620 d	38	760	200	2360 b	75	1180	
hexazinone	0.9	3950 b	3	T*	0	5630 a	0	8	
hexazinone	1.13	4230 a	5	T	0	-	-	-	
hexazinone	1.35	4050 b	0	T	0	6460 a	0	T	
**hexazinone	1.5	-	-	-	-	6190 a	0	T	
hexazinone	2.7	3700 c	0	0	0	5600 a	0	0	
CV%		8.5				25.7			

* Trace amount ** hexazinone liquid formulation 250g/litre this treatment only

TABLE 3: Lucerne Production and weed control results: Trials 5,6,6 and 8 Nodding thistle browntop and woolly mullein.

Treatment Data		Trial 5				Trial 6				Trial 7	Trial 8
Date treated		27/9/77				30/10/79				1/11/78	12/12/80
Lucerne age and height		3 yrs, 10-15 cm									
Weed growth stage		Vegetative				Rosette				50% rosette 50% bolted	20% rosette 80% bolted
Date assessed		24.11.77	27.2.78	16.1.78	28.4.79	23.1.80	16 WAT		21.1.79 (12 WAT)	12.1.81 (4 WAT)	
Treatment	Rate kg/ha	Lucerne prod. kg DM/ha		Browntop % of plot		Woolly Mullein % Live Plants/Plot			Nodding Thistle % control	Nodding Thistles per plot	
		8 WAT	22 WAT	16 WAT	66 WAT	Control	Rosette	Bolted			
untreated		940 b	960 b	50	42	0	150	120	0	31	
hexazinone	0.9	1640 a	1430 a	T	5	96	6	5	100	0	
hexazinone	1.13	-	-	-	-	99	2	1	-	0	
hexazinone	1.35	1400 a	1520 a	T	3	99	1	0	100	0	
hexazinone	1.8	1470 a	1650 a	0	1	-	-	-	100	-	
hexazinone	2.7	1400 a	1520 a	0	5	100	0	0	100	0	
hexazinone	3.6	1340 a	1470 a	0	3	-	-	-	100	-	
MCPB	1.2	-	-	-	-	-	-	-	70	-	
CV%		18.9		8.0							

MCPB at 1.2 kg/ha was evaluated in trial 7. It gave control of the small rosette nodding thistles, but left the more mature rosettes and bolting thistles, giving only 70% control overall.

Barley grass

Barley grass infestation in trials 2,3 and 4 was extremely severe. Herbage dissection

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results indicate that in trials 2 and 3 barley grass accounted for approximately 30% of total dry matter production in untreated plots.

Hexazinone at rates of 0.9 kg/ha and above in trial 2, gave 95% reduction in barley grass but complete eradication was achieved only at 2.7 kg/ha. The treatments were made to vegetative plants, prior to seedhead formation. In trial 3 with barley grass at the early green seedhead stage when treated, almost complete control was achieved at all hexazinone treatment rates. Results were similar in trial 4 when the barley grass was at green seedhead to flowering stage. Only hexazinone at 2.7 kg/ha gave complete control, with 0.9 — 1.5 kg/ha still leaving an occasional plant. Barley grass seedheads took longer to break down in trial 4, because of the more mature development stage. As such they could continue to pose a stock health problem.

Woolly mullein

Hexazinone applied to rosette woolly mullein in October gave almost complete control of all plants at 1.13 kg/ha but 2.7 kg/ha was needed to obtain 100% control (trial 6).

Browntop

Browntop infestations of 25% at treatment were reduced to trace amounts from hexazinone applications of 0.9 — 1.35 kg/ha in late September. Rates of 1.8 kg/ha and above gave 100% control (trial 5). Sixteen months after application browntop reinfestation was only slight in all treated plots, when compared to the 42% infestation in untreated plots. These results compared well with data presented by James and Atkinson (1979).

White clover

White clover was completely controlled by hexazinone at all treatments from 0.9 kg/ha upwards. Treatments were made in late September and late October prior to white clover flowering (trials 2 and 3).

DISCUSSION

Slight yellowing of lucerne foliage occurred after treatment of actively growing lucerne in spring and summer with hexazinone. Observations from other trials showed that phytotoxic effects were decreased as the amount of lucerne foliage at treatment was decreased. Observations also indicated that soil type, soil moisture, and age of the lucerne stand at treatment were important in determining the degree of lucerne tolerance. Younger stands growing in lighter soils, and lower moisture conditions were more susceptible to damage.

The rate of hexazinone needed to give satisfactory nodding thistle control is dependent on the thistle growth stage at treatment, with bolting thistles being controlled at lower treatment rates than rosette thistles. Similarly barley grass control was better when applications were made to the green seedhead growth stage in preference to the vegetative growth stage.

Results in this paper show that by controlling severe weed infestations with hexazinone, there could be an increase in lucerne productivity, and as suggested by James and Atkinson (1979) a prolonging of the productive life of the lucerne stand.

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