CONTROL OF BROWNTOP IN LUCERNE ON PUMICE SOILS

T. K. JAMES AND G. C. ATKINSON

*Ruakura Soil and Plant Research Station
MAF, Hamilton.*

Summary

Browntop (*Agrostis tenuis*) is a serious perennial weed in many lucerne (*Medicago sativa*) stands and is considered to shorten their life. The results of six trials in the Reporoa area reported here show that hexazinone, and ethidimuron plus paraquat, were effective in controlling browntop and that short term control could also be achieved with paraquat plus simazine, cyanazine, propyzamide and carbetamide.

INTRODUCTION

Browntop was introduced into New Zealand in the mid 1800's (Allan 1940), and since then has formed one of the basic components of low fertility pastures and has become a problem in some perennial crops. Fitzgerald (1957) reported that browntop was probably the most serious grass weed to invade lucerne and Sewell (1960) said grass weeds, including browntop, were choking South Island lucerne stands and limiting their life to 4 or 5 years. However Fitzgerald (1957) claimed that browntop posed no problem as it was readily controlled by 2,2-DPA at 3.4 - 4.5 kg/ha and Sewell's (1960) answer to the problem was 2,2-DPA + TCA at 5.6 + 5.6 kg/ha.

Since then most reports on the control of browntop have merely been on the spectrum of weeds controlled or not controlled by new herbicides. Leonard (1957) reported that paraquat defoliated the browntop but it later recovered. Miles (1969) noted that carbetamide gave 74% reduction of cover at 3.4 kg/ha and 96% at 4.5 kg/ha, while Rae and Paterson (1973) found that isobumeton with or without simazine only gave adequate control at high rates, 2.25 + 2.25 kg/ha and 4.5 kg/ha respectively.

On the pumice soils of the North Island, despite improved management and soil fertility, browntop still poses a serious threat to lucerne stand longevity. Control with currently recommended herbicides is not sufficiently effective and stands are being reinvaded by browntop after 1 or 2 years.

This paper reports on six trials conducted with the aim of finding herbicides providing better control of browntop in lucerne.

METHODS AND MATERIALS

All trials were conducted in the Reporoa area on Taupo sandy loam. Trial 1 was laid down in winter 1977, and tested several herbicides (Table 1), the most promising of which were chosen for trial work the following year. Trials 2 and 3 tested these chemicals at two locations. It was also decided to look more closely at three of these herbicides. Hence trials 4, 5 and 6 tested rates of cyanazine, ethidimuron with or without paraquat and hexazinone respectively.

All experiments were of a randomised block design with four replicates, except trial 1 which had six replicates. All chemicals were

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applied with a CO₂ powered precision sprayer delivering 290 litres/ha of solution. Assessment of herbicide efficacy for browntop control was made by drying and weighing the viable browntop rhizomes (i.e., those rhizomes that were neither rotting nor desiccated) taken from 7.5 cm diameter soil cores, 5 cm deep from each plot. Lucerne dry matter yields were recorded in all trials and the herbage dissected on Trial 2 only.

RESULTS AND DISCUSSION

First year results from Trial 1 showed that paraquat plus simazine, hexazinone, propyzamide, ethidimuron and cyanazine were sufficiently promising to be tested further, looking especially at rates and timing of application. Sampling the trial again at the end of its second year confirmed the early results from hexazinone and ethidimuron treatments (Table 1). Ethidimuron at the rate used was toxic to lucerne so rates were lowered in subsequent trials and a knock-down herbicide (paraquat) was added. The rate of hexazinone was also too high.

TABLE 1. Lucerne production and browntop rhizome reduction from trial 1, treatments applied on 26.7.77.

Treatment	Rate kg/ha	Lucerne production*	Browntop rhizomes**
2,2-DPA	6.0	114 cd	77 ab
paraquat + simazine	0.5 + 1.0	128 bc	80 ab
hexazinone	3.0	136 ab	98 a
glyphosate	2.0	83 f	42 abc
terbacil	0.75	146 a	27 bc
propyzamide	3.0	118 cd	71 b
ethidimuron	3.0	86 ef	95 a
cyanazine	2.0	113 cd	66 ab
untreated		100 de (5570 kg/ha)	8 c
CV%		5.1	47.1

* total of 4 cuts in 1977-78 season expressed as % of untreated control

** expressed as % reduction from pre-treatment sampling weights 1.7.77-2.3.79

The results from the subsequent trials (Tables 2 - 5) showed hexazinone and ethidimuron controlled browntop when used at much lower rates. Hexazinone however gave good weed control and crop tolerance over a wider range of application rates than ethidimuron. Browntop control by paraquat plus simazine, carbetamide and cyanazine was more variable. Each of these chemicals achieved a good initial knock-down. It appeared however, that if other factors such as shading, did not occur quickly, most of the browntop recovered and was able to reinfest the lucerne, resulting in short term control only.

Browntop was not the only weed grass present in these trials. There were also heavy infestations of Yorkshire fog (*Holcus lanatus*) and bromus mollis (*Bromus mollis*) which were controlled by all herbicides tested. The reduction in dry matter production on treated plots compared with untreated, as shown in Tables 3 - 5 (where dry matter production is not corrected to lucerne alone) is due mainly to the presence of weed grasses other than browntop. The effect of removing browntop is not so marked in terms of increasing dry matter production as in prolonging the productive life of the lucerne.

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TABLE 2. Production of lucerne and browntop rhizomes, as percentages of untreated controls, from trials 2 and 3.

Treatment ⁺	Rate kg/ha	Trial 2		Trial 3	
		1st cut 11.12.78			
		% Lucerne	Lucerne DM	Browntop rhizomes	Browntop rhizomes
paraquat	0.5	60 bc	109 bc	91 ab	42 b
paraquat + simazine	0.5 + 1.0	95 a	151 ab	35 abc	14 bc
paraquat + ethidimuron	0.5 + 0.7	99 a	150 ab	8 c	1 c
paraquat + cyanazine	0.5 + 2.0				9 bc
ethidimuron	0.7	88 a	141 abc	11 c	
cyanazine	2.0	91 a	150 ab	64 abc	2 c
carbetamide	3.0	69 b	124 abc	30 bc	11 bc
hexazinone	1.0	99 a	154 a	3 c	0 c
hexazinone ††	1.0	99 a	134 abc	7 c	0 c
untreated		47 c	100 c	100 a	100 a
CV%		7.0	(1690 kg/ha) 9.9	(372 kg/ha) 55.2	(1397 kg/ha) 57

+ treatments applied on 28.7.78 for Trial 2 and 28.8.78 for Trial 3 except where noted

†† applied on 3.10.78 for Trial 2 and 22.9.78 for Trial 3.

TABLE 3. Production of lucerne + grass and browntop rhizomes, as percentages of untreated control, from trial 4. Treatments applied on 28.7.78.

Treatment	Rate kg/ha	Total DM		Browntop rhizomes
		11.12.78	21.2.79	21.3.79
cyanazine	1.5	67 b	104	58 b
cyanazine	2.0	64 b	96	41 bc
cyanazine	4.0	67 b	105	5 cd
cyanazine	6.0	61 b	107	0.7 d
untreated		100 a	100	100 a
CV%		(3560 kg/ha) 4.7	(1350 kg/ha) 11.1	(737 kg/ha) 29.6

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TABLE 4. Production of lucerne + grass and browntop rhizomes, as percentages of untreated control, from trial 5. Treatments applied on 28.7.78.

Treatment	Rate kg/ha	Total DM		Browntop rhizomes 21.3.79
		11.12.78	21.2.79	
ethidimuron	0.35	84 b	101	93 a
ethidimuron	0.70	65 cd	104	27 b
ethidimuron	1.4	67 cd	114	0 b
ethidimuron + paraquat	0.35 + 0.5	71 bc	105	18 b
ethidimuron + paraquat	0.7 + 0.5	66 cd	103	6 b
ethidimuron + paraquat	1.4 + 0.5	56 d	104	0.7 b
untreated		100 a (3650 kg/ha)	100 (1300 kg/ha)	100 a (278 kg/ha)
CV%		5.94	8.5	55.8

TABLE 5. Production of lucerne + grass and browntop rhizomes, as percentages of untreated control, from trial 6. Treatments applied on 3.10.78.

Treatment	Rate kg/ha	Total DM		Browntop rhizomes 21.3.79
		11.12.78	21.2.79	
hexazinone	0.5	69 b	110 a	10 bB
hexazinone	1.0	67 b	105 ab	3 bB
hexazinone	1.5	64 bc	121 a	5 bB
hexazinone	2.0	71 b	107 a	1.6 bB
hexazinone	3.0	55 c	83 b	0 bB
untreated		100 a (2980 kg/ha)	100 ab (1220 kg/ha)	100 aA (900 kg/ha)
CV%		5.2	7.0	27.5

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