CONTROL OF BARLEY GRASS BY ETHOFUMESATE

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Summary

A series of plot trials in established pastures in Waikato, Canterbury and Coastal Otago investigated the optimum rate and time of application of ethofumesate for barley grass (*Hordeum* spp) control. The May/June period proved optimum with reasonable activity extending through till August in the South Island. A rate of 2.0 kg/ha gave total kill at optimum time in the South Island with a high level of control at 1.0 kg/ha. In the Waikato 2.0 kg/ha was necessary for reasonable control. Ryegrass (*Lolium perenne*) and cocksfoot (*Dactylis glomerata*) tolerated 4.0 kg/ha at all times, but prairie grass (*Bromus unioloides*) showed similar susceptibility to barley grass. Clovers (*Trifolium* spp) were eliminated or severely depressed at optimum time and rates for barley grass control.

INTRODUCTION

Ethofumesate then NC8438 was first tested for control of barley grass (*Hordeum murinum*) in a pilot trial in the Waikato in 1971 (Hartley, 1972) and the results showed considerable promise. In the following two years trials were extended to cover other parts of New Zealand to determine optimum times and rates of application in the different areas.

METHOD

The trials were in two series. One set (9 trials) compared ethofumesate at 1.0 and 2.0 kg/ha applied at monthly intervals (mid-month) over a five or six month period. The other (6 trials) compared a series of rates between 0.5 and 4.0 kg/ha at a single time or (in Canterbury) at two times. At most sites propyzamide, carbetamide and/or a mixture of 2,2-DPA and TCA were included for comparison at rates and times considered optimum for the district.

In 1972, trials were in both dairy and sheep pastures in Waikato and Canterbury and in sheep pastures in coastal Otago. In 1973 similar sites were used in Canterbury and Otago. Observation trials were also laid down in Hawkes Bay and a "rates" trial on a site containing *Hordeum glaucum* in North Canterbury.

On the understanding that ethofumesate was likely to have most effect against emerging seedlings, the 1972 trials were started in the February/March period to cover late summer/autumn germination of barley grass. Because of the markedly superior results of the late application in 1972 the starting time was delayed until April 1973 and treatments continued until August in Otago and September in Canterbury.

Four replicates using 15 to 20 m^2 plots were boom sprayed using 200 litres/ha in the South Island and 400 litres/ha in the North Island. Pasture was grazed short at time of treatment.

In Canterbury and Otago the sites were oversprayed to control docks (*Rumex* spp.) in the dairy pastures and thistles, principally *Carduus tenuifolius*, in the sheep pastures using butyric herbicides to avoid interfering with the clovers.

Barley grass assessment was made by "seed head" counts (Waikato) or estimated cover at maximum "seed head" stage (Canterbury, Otago and Hawkes Bay). After 10 to 12 months pasture composition was measured by point analysis in Otago and by estimated cover and, in one instance, a dry matter cut in Canterbury. Dry matter production for the growing season following treatment was measured in Waikato.

RESULTS

To assist the comparison of results from this diversity of trials and assessments, the assessments have been expressed as a percentage of the untreated amount. The barley grass results have been averaged and are presented in graph form (figures 1 and 2). It follows from the changes in the periods covered by the trials that there is more data relating to the April to July period than for earlier or later months

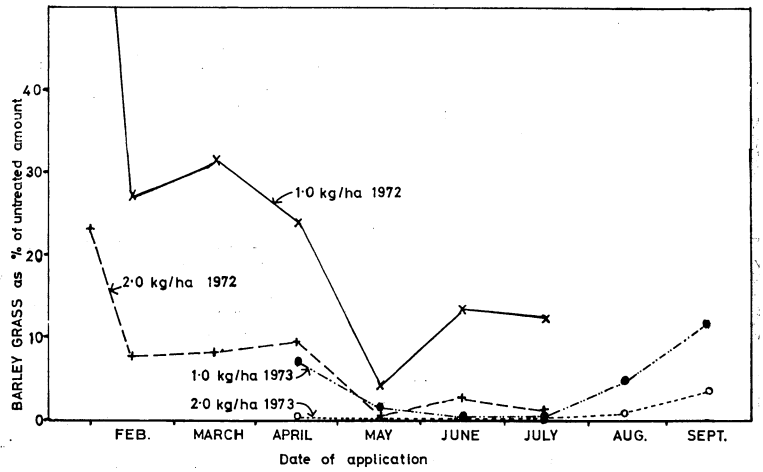

Fig 1: The effect of time of application of ethofumesate on barley grass control.

Time of Application (Fig. 1)

The 1.0 kg/ha graphs indicate a marked increase in effectiveness from April to May at all sites in both seasons, May being superior to April in the nine comparisons made. In 1972 a fall in effectiveness occurred in June in Otago and in the Canterbury dairy pasture with a similar trend in 1973 in Hawkes Bay. Overall control in South Island trials was better in 1973 than in 1972, and the fall in effectiveness did not occur until or after the July treatments. Of the eight May/June comparisons at 1.0 kg/ha, June was inferior on two occasions (1972) and May inferior on one occasion (Canterbury 1973). Of six May/July comparisons, one (Otago 1972) favoured May and one (Canterbury 1973) favoured July. However in the 1973 rate of application trials the overall comparison of May versus July, favoured May.

Rate of Application (Fig. 2)

The graphs indicate the improvement in control achieved by increasing the rate of ethofumesate. Differences in control between 0.5, 1.0 and 2.0 kg/ha were significant in all months tested but 4.0 kg/ha was better than 2.0 kg/ha only in August, though this rate gave a higher proportion of zero scores than the 2.0 kg rate at all times.

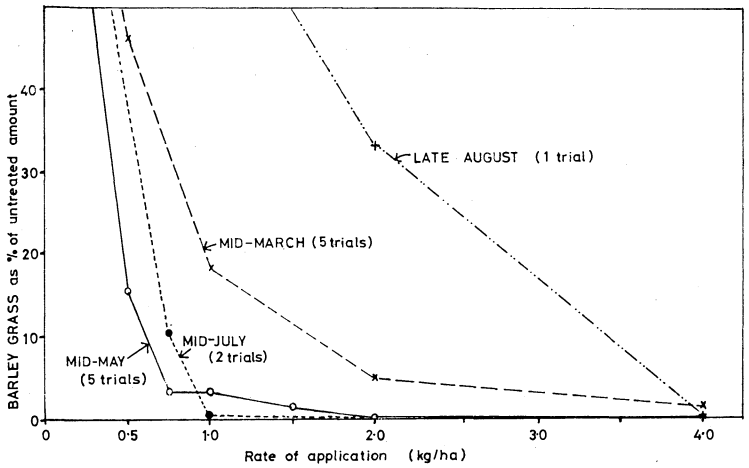

Fig. 2: The effect of increasing the rate of application of ethofumesate, at various times, on barley grass control.

Pasture Legumes

Pasture legumes proved to be highly susceptible to ethofumesate. When present, suckling clover *(Trifolium dubium)* subterranean clover *(T. subterraneum)* and clustered clover *(T. glomeratum)* were killed at 1.0 kg/ha. Spotted bur medick *(Medicago arabica)* was killed at 2.0 kg/ha (not tested at 1.0 kg/ha). In the case of white clover *(T. repens)* the foliage died back leaving leafless rhizome segments, the majority of which eventually died. Only in the dairy pasture at Lincoln under sprinkler irrigation and rotational grazing was there appreciable regrowth after 1.0 kg/ha applied in May and June (Table 1).

Pasture Grasses

The ryegrass and cocksfoot content of plots treated in the May/July period had increased independantly of rate and time of application when measured 10 to 12 months after treatment (Table 1).

Prairie grass *(Bromus unioloides)* showed a similar dose rate and time response to barley grass. It was almost eliminated by 1.0 kg/ha in May and 2.0 kg/ha in July but surviving plants were growing vigorously in the following autumn.

TABLE 1: ASSESSMENTS OF PASTURE COMPONENTS 10 to 12 MONTHS AFTER ETHOFUMESATE TREATMENT
Assessments expressed as % of untreated

Species	*Locality*	*Rate kg/ha*	*Month treated* April	May	June	July	*Untreated*
Ryegrass*	Coastal	1.0	122 bAB	127 abAB	132 abA	128 abA	100 cC
	Otago	2.0	138 abA	139 aA	138 abA	130 abA	
Ryegrass**	North	1.0	158 aA	138 abA	145 abA	143 abA	100 bA
	Canterbury	2.0	147 aA	151 aA	147 aA	147 aA	
Prairie*** grass	Central	1.0	31 bcBC	18 cdBC	21 cdBC	51 bB	100 aA
	Canterbury	2.0	7 cdC	2 dC	3 cdC	16 cdBC	
White*** clover	Lincoln	1.0	43 abAB	27 bB	25 bB	—	100aA
		2.0	14 bB	8 bB	2 bB	—	

* Point analysis mean of 4 trials
** Dry matter autumn regrowth, March 1974
*** Visual assessment of ground cover

Dry Matter Production

This was measured on two Waikato sites. The effect on dry matter production was slight but depression increased with later application. Increasing the rate of ethofumesate had no effect on dry matter production though the lowest rate appeared to cause a stimulation.

Comparison with Other Chemicals

Ethofumesate at 2.0 kg/ha gave, in the South Island, equivalent or better control than the chosen rates of the TCA + 2,2-DPA mixture, propyzamide or carbetamide (0.9 + 5.0, 0.9 and 2.5 kg/ha in Otago and 0.9 + 5.0, 0.6 and 2.5 kg/ha in Canterbury), and was more effective than 0.5 kg/ha propyzamide and 2.0 kg/ha carbetamide in the Waikato.

DISCUSSION

The trials have established that ethofumesate will kill well established barley grass plants as well as seedlings. They identify the May/June period as optimum for application and show that this period can be extended by increasing the quantity of chemical used. While the pattern is the same for the three regions, consideration of sub-optimum treatments from individual trials indicates that, in Waikato and in Canterbury dairy pastures, there is less latitude in timing and that earlier (May) application is required. This may be related to earlier autumn growth in these situations with the converse, later autumn growth, characterizing the conditions leading to the later optimum time (June) and better results experienced in the South Island in 1973 when autumn growth was later starting than in 1972. A seasonal variation is implied.

Complete kill has been taken as the measure of optimum rate since surviving plants act as nuclei for re-establishment of the weed. This standard has been achieved in the South Island with 2.0 kg/ha or even 1.5 kg/ha in some trials but has only been achieved at the 4.0 kg/ha rate in Waikato. The optimum rate is thus at or slightly below 2.0 kg/ha in the South Island and above 2.0 kg/ha in Waikato. However lower rates may be acceptable under field conditions. In the sheep pastures with good ryegrass content, 1.0 kg/ha has given a very high level of kill of barley grass, ryegrass cover has increased and barley grass content has been markedly reduced in the following season.

The fall in effectiveness with time shown by the position of the August 30th line in Figure 2, is greater than indicated by the time of application trials. This is attributed to the earlier maturity of *H. glaucum*, the main barley grass component at the site, since a fortnight later control by 2.0 kg/ha was satisfactory at sites containing *H. murinum* and some *H. leporinum*. Control of all species (including *H. hystrix* at Napier) was similar in May.

Since ryegrass and cocksfoot tolerate ethofumesate and clovers are severely depressed or eliminated, ethofumesate can be described as providing a 'grass tolerant' route for selective control of barley grass in pasture, paralleling the 'clover tolerant' route of propyzamide and carbetamide and the 'partial clover/grass tolerant' route of TCA and 2,2-DPA + TCA mixtures.

Though complete tolerance of pasture grasses and clovers is very desirable, short term clover toxicity is not a disqualifying character. Extensive infestations of barley grass occur in districts subject to summer drought and the sites are often low in clover content. Build up of clover and recovery of ryegrass and clover following 'clover tolerant' and 'partial tolerant' treatments has frequently not occurred by the time drought stops growth, leaving a net loss of production and bare ground

for future weed invasion. By leaving ryegrass undamaged (and preferably re-inforcing it before or immediately after treatment) loss of production in the spring and early summer will be kept to a minimum and the competitive potential of the sward improved.

ACKNOWLEDGEMENTS

The assistance of Messrs G. C. Atkinson, G. A. Douch, T. G. Smallridge, H. McRobb and R. B. Mitchell and the co-operation of the farmers who provided trial sites is acknowledged.

REFERENCE

Hartley, M. J., 1972. NC8438 for control of seedling barley grass. *Proc. 25th N.Z. Weed and Pest Control Conf.*, 62-63.