WEED CONTROL IN SPACED PASTURE PLANTS

J. D. HENDERSON and J. L. BROCK

Grasslands Division, DSIR, Palmerston North

Summary

Ethofumesate and methabenzthiazuron were tested for weed control in spaced planting and row sowings of 'Ruanui' and 'Tama' ryegrasses (*Lolium perenne, L. multiflorum*), tall fescue (*Festuca arundinacea*), 'Matua' prairie grass (*Bromus catharticus*), browntop (*Agrostis tenuis*), and white clover (*Trifolium repens*). Weeds were more effectively controlled by methabenzthiazuron than ethofumesate, particularly with spring applications. Ethofumesate was highly toxic to prairie grass and reduced browntop growth at highest rate (5 kg/ha) but did not affect ryegrass or tall fescue plants. Methabenzthiazuron had no effect on prairie grass and tall fescue, but reduced the growth of the ryegrasses and browntop at 5 kg/ha and white clover at 3 kg/ha.

INTRODUCTION

The breeding of new pasture plants involves evaluation of large numbers of plants established either as single plants at 0.6 m spacings or from sowings in rows. Under these conditions weed control is a major problem, and at present cultivation methods are used. Although weeds are a problem throughout the year, control by cultivation is the most difficult in autumn and winter. Chemical control of weeds must be highly selective as damage to the desired species cannot be tolerated in plant breeding programmes.

After a broad screening trial two herbicides, methabenzthiazuron and ethofumesate were selected for further investigation.

METHODS

Trial 1 Autumn

This was established at Palmerston North on a Manawatu silt loam (organic matter 8.0%) to test ethofumesate and methabenzthiazuron for weed control in spaced transplants. Test species were 'Grasslands Ruanui' perennial ryegrass (*Lolium perenne*), 'Grasslands 4710' tall fescue (*Festuca arundinacea*), 'Grasslands Matua' prairie grass (*Bromus catharticus*), and browntop (*Agrostis tenuis*).

Herbicide treatments were ethofumesate and methabenzthiazuron applied post planting on 31 May 1974, each at 0, 1.05, and 2.1 kg/ha.

A split plot design with three replications used the spray treatments as main plots (1.2 × 1.8 m) and the four grass species, as rows of six plants, were randomised as sub-plots. Grasses were planted on 7 May 1974.

Visual growth scores (0 - 10 scale) were taken in September 1974 on weed growth in main plots and on individual spaced plants in sub-plots.

Trial 2 Spring

A further trial using a wider range of species and application rates was established in November 1974 on Kairanga silt loam (organic matter 9.7%) at Grasslands Division's Aorangi research station. Test species used were 'Ruanui' perennial ryegrass, 'Grassland Tama' Westerwolds

ryegrass (*Lolium multiflorum*) and G. 4710 tall fescue with both herbicides plus browntop, 'Matua' prairie grass and 'Grasslands Huia' white clover (*Trifolium repens*) with methabenzthiazuron only. Both spaced plantings and seed sowings in rows were tested.

Herbicide treatments were : —

Pre-planting; ethofumesate at 0, 1.5, 3.0, 4.0, and 5.0 kg/ha
methabenzthiazuron at 0, 0.75, 1.5, 3.0, and 5.0 kg/ha.

These were incorporated into the top 5 cm of soil by rotary cultivator on 11 November 1974.

Post-emergence. Same rates as pre-planting applied to soil surface on 11 December 1974 when weeds were 2 - 3 cm in height.

A split plot design with three replications used herbicide treatments as main plots with species, transplants and sowings in rows as sub-plots.

Growth of sown species and weed control were scored visually on 14 January 1975, and 1 April 1975 following grazing on 24 February 1975.

RESULTS

Effective weed control, chiefly poa annua (*Poa annua*), toad rush (*Juncus bufonius*), twincress (*Corynopus didymus*) and shepherds purse (*Capsella bursa-pastoris*), was achieved by both herbicides, methabenzthiazuron being better than ethofumesate. Ryegrass and tall fescue increased growth with ethofumesate treatments and to a lesser extent with methabenzthiazuron, whereas prairie grass while not affected by methabenzthiazuron was severely reduced by ethofumesate, being virtually eliminated at the higher rate. Browntop was affected only by the high rate of both herbicides.

Weed control (Table 2), chiefly of fathen (*Chenopodium album* agg), black nightshade (*Solanum nigrum*), twincress, and redroot (*Amaranthus powellii*), by both herbicides increased with increasing rate, methabenzthiazuron being generally more effective than ethofumesate. By April the effectiveness of ethofumesate had declined where applied post-emergent and new weeds had established, while weed control by methabenzthiazuron post-emergence had increased, resulting in good long-term weed control.

There was no interaction between pre- and post-emergence treatments on the growth of test species. Ethofumesate had no effect on any of the test species from transplants or sowings except tall fescue established from seed only. Methabenzthiazuron showed no damage to tall fescue or 'Matua' at any rate, while 'Ruanui', 'Tama', and browntop were reduced at 5 kg/ha and 'Huia' at 3 kg/ha and above at January 1975 (Table 3). Results were similar in April.

TABLE 1 : EFFECTS OF METHABENZTHIAZURON AND ETHOFUMESATE ON THE GROWTH OF WEEDS AND FOUR GRASS TEST SPECIES

(10 = no effect, 0 = complete death)

			Plant species			
Treatment	*Rate kg/ha*	*Weeds*	*Rye-grass*	*Tall fescue*	*'Matua'*	*Brown-top*
untreated		9.0 a	6.4 bc	6.9 b	8.1 a	7.8 a
methabenzthiazuron	1.05	2.7 bc	7.1 b	7.9 ab	8.3 a	7.3 a
methabenzthiazuron	2.0	1.0 d	6.2 c	7.5 ab	7.4 a	5.4 b
ethofumesate	1.05	3.3 b	7.6 ab	8.1 a	4.9 b	7.5 a
ethofumesate	2.10	2.3 c	8.7 a	8.6 a	0.4 c	4.1 c

TABLE 2: MEAN GROWTH SCORES FOR WEEDS (EXPRESSED AS PERCENTAGE OF CONTROL) TREATED WITH ETHOFUMESATE AND METHABENZTHIAZURON

		Treatment time and assessment date		
Treatment	*Rate kg/ha*	*Pre- and post-emergent January*	*Pre-emergent April*	*Post-emergent April*
untreated		100 a	100 abc	100 abc
ethofumesate	1.5	77 ab	123 ab	133 a
ethofumesate	3	59 bcd	77 bcd	133 a
ethofumesate	4	64 bc	47 cde	116 ab
ethofumesate	5	33 de	40 de	86 bcd
methabenzthiazuron	0.75	70 b	86 bcd	100 abc
methabenzthiazuron	1.5	51 bcd	140 a	40 de
methabenzthiazuron	3	38 cde	70 bcd	0 e
methabenzthiazuron	4	18 e	7 e	0 e

TABLE 3: MEAN JANUARY GROWTH SCORES OF TEST SPECIES FROM TRANSPLANTS AND SOWINGS TREATED WITH METHABENTHIAZURON

(10 = no effect, 0 = complete death)

		Plant species					
Treatment	*Rate kg/ha*	*'Ruanui'*	*'Tama'*	*tall fescue*	*'Matua'*	*browntop*	*'Huia'*
untreated		9.9 a	9.7 a	8.8 b	9.9 a	3.2 a	8.7 ab
methabenzthiazuron	0.75	9.9 a	9.5 a	9.2 a	9.5 a	3.8 a	9.5 a
methabenzthiazuron	1.5	8.9 ab	9.7 a	8.9 ab	9.7 a	3.3 a	8.4 b
methabenzthiazuron	3	9.6 a	9.8 a	8.9 ab	9.4 a	4.0 a	6.0 c
methabenzthiazuron	5	8.8 b	8.2 b	8.1 bc	9.5 a	1.7 b	2.4 d

Test species, apart from seeded browntop, had established well from both plants and seeds. By April browntop was dead with white clover and tall fescue established from seed reduced approximately 35%. This was possibly as a result of the hot, dry summer/autumn experienced (only 57.3 mm rainfall during February and March) which affected the slower establishing species.

DISCUSSION AND CONCLUSIONS

Any herbicide used in spaced plant evaluations of herbage species must be strictly selective against weeds only. The results of these experiments would indicate the following:

1. (a) For ryegrass and tall fescue, ethofumesate at rates of up to 2 kg/ha in autumn and 3 kg/ha in spring would give sufficient weed control with the best safety margin.

   (b) Methabenzthiazuron would maintain better long-term weed control but with greater damage risk at high rates (Table 3).

2. Only methabenzthiazuron would be suitable for 'Matua' (Table 1) and white clover (Brock and Henderson 1976). Their susceptibility to ethofumesate parallels the results of Minter (1974) and Allen *et al* (1974).

3. Care would be necessary with either herbicide for use on browntop. Methabenzthiazuron has also been shown to affect adversely browntop under turf conditions (Robinson pers comm).

A possible cause of the poorer weed control in spring by ethofumesate than methabenzthiazuron could be due to three factors. The higher soil organic matter at Aorangi, the warmer temperatures accelerating breakdown by micro-organisms (Hoogstraten *et al* 1974), and the dry soil conditions following the post-emergence application reducing root absorption of the herbicide (Hartley 1975) would all contribute to its poor effectiveness.

Methabenzthiazuron is relatively unaffected by soil moisture at application (Becker and Plüghan 1969) and operates best at warm temperatures (Hack 1969). Being a photosynthesis inhibitor and absorbed by both roots and leaves its activity is best in the post-emergence phase particularly when transpiration of the weeds is high (Hack 1968; Budd and Evans 1972), hence the better long term weed control by the post-emergence treatments (Table 2).

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