THE CONTROL OF BARLEY GRASS WITH CARBETAMIDE

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Summary

The control of barley grass (*Hordeum murinum*) by carbetamide has been evaluated over a three-year period in the major barley grass infested regions of New Zealand. The investigations have demonstrated that applications of carbetamide at rates as low as 2.2 kg/ha, applied between mid-winter and early spring, controls 90% or more of the barley grass. At the rates necessary for satisfactory barley grass control, ryegrass (*Lolium perenne*) damage is pronounced for a period of at least three months after spraying and the white clover (*Trifolium repens*) content of the sward increases considerably.

INTRODUCTION

VARIOUS INVESTIGATIONS of chemical control of barley grass (*Hordeum murinum*) in pastures have been reported. However, only Atkinson (1970) and Meeklah *et al.* (1970) have previously described evaluations of carbetamide for control of this weed. Atkinson concluded that carbetamide at 3.4 kg/ha and TCA at 11.2 kg/ha applied between winter (early June) and spring (September) in southern Waikato controlled barley grass without decreasing pasture dry matter production. However, Atkinson's trials were not grazed, and grazing has been shown by Meeklah *et al.* (1970) to increase pasture damage following herbicide application. In their report concerning the use of carbetamide, TCA and 2,2-DPA for barley grass control in coastal Otago, Meeklah *et al.* (1970) established from their 1967-8 series of trials that carbetamide at 2.2 kg/ha applied in spring rather than winter appeared to give a reasonable degree of barley grass control when compared with TCA and 2,2-DPA, especially if the subsequent growing season is dry. Unlike Atkinson, however, these latter authors exposed their trial plots to stock and they subsequently observed pasture damage following carbetamide application.

For three seasons, carbetamide has been evaluated by the writers with a view to establishing the degree of reliability of barley grass control by this herbicide. Assessments of the effect of carbetamide on other desirable pasture species such as perennial ryegrass (*Lolium perenne*) and white clover (*Trifolium repens*) have also been made to determine whether carbetamide would give selective barley grass control in normal pasture situations. Details and results of these trials are presented below.

EXPERIMENTAL METHODS

All herbicide applications were made using a wheeled, small-plot precision sprayer spraying over a 1.8 m swath. Plot length varied between trials from 9 to 15 m according to site, while volumes of application

varied from 225 to 326 l/ha. All treatments were replicated twice and randomly arranged at each site.

Simple visual assessments of desirable pasture species (mainly ryegrass and clover) were made periodically after spraying by two or more independent observers. During the mid-summer period for the 1970-1 and 1971-2 series of trials, barley grass seed-heads were counted in an effort to assess quantitatively the degree of barley grass control.

RESULTS

1968-69 Series of Trials

Applications were made at three sites during spring (mid- to late September). Results of the early summer assessments are seen in Table 1. Carbetamide at 4.5 kg/ha has given the most consistent degree of control (90 to 95% control). The percentage cover by ryegrass has varied inconsistently following spraying, while white clover cover has increased considerably. The North Island plots were situated on a short sheep pasture while the South Island trials were on a long dairy sward. All plots were situated in stock camp areas.

TABLE 1: 1968-9 SERIES OF TRIALS—COMPOSITION OF SWARD
(Sprayed mid/late Sep., 1968. Assessed Dec.-Jan., 1968-9)

Site and Carbetamide Treatment (kg/ha)	*% Cover (Visual Assessment)*		
	Barley Grass	*Ryegrass*	*Clover*
Wairarapa:			
2.2	2	8	20
3.4	0	2.5	25
4.5	2	0.5	35
Unsprayed	77	10	0
Canterbury:			
2.2	37	4	55
3.4	16	1	68
4.5	3.5	2.5	84
Unsprayed	76	1	20
South Canterbury:			
2.2	6	17	14
3.4	16	30	30
4.5	0.5	35	23
Unsprayed	57	16	5

1970-71 Series of Trials

Carbetamide was applied at the same rates as employed in the 1968-9 series of trials. However, mid-winter as well as early spring applications were made. A comparative treatment of a TCA/2,2-DPA mixture was also applied. Plots were situated in mid-paddock areas of even barley grass infestation. Results of these trials are seen in Table 2. It is clear from the results that 3.4 kg/ha applied in mid-winter gives control in excess of 90% when the seed-head counts are examined, while carbetamide at

TABLE 2: 1970-1 SERIES OF TRIALS—COMPOSITION OF SWARD

Sprayed: Mid-winter applications (M.W.) = early July 1970.
Early spring applications (E.S.) = late August 1970.

Assessed: Late December - early January 1970-1.

Site and Treatment (kg/ha)	*Composition of Sward**					
	Barley Grass		*Ryegrass*		*Clover*	
	M.W.	*E.S.*	*M.W.*	*E.S.*	*M.W.*	*E.S.*
Manawatu (1):						
Carbetamide 2.2	76	67	44	10	14	72
Carbetamide 3.4	26	25	31	2	18	62
Carbetamide 4.5	9	24	10	8	20	55
TCA 4.9/2,2-DPA 0.9	16	0	78	56	1	18
Unsprayed	166		53		6	
Manawatu (2):						
Carbetamide 2.2	0.25	19	21	20	19	28
Carbetamide 3.4	4	13	2	29	26	19
Carbetamide 4.5	0	4	0	9	49	26
TCA 4.9/2,2-DPA 0.9	0	0.25	80	72	8	5
Unsprayed	68.5		52		1	
Southern Hawke's Bay:						
Carbetamide 2.2	170	92	28	28	42	32
Carbetamide 3.4	86	68	18	9	49	29
Carbetamide 4.5	31	19	4	12	64	30
TCA 4.9/2,2-DPA 0.9	16	7	45	29	20	19
Unsprayed	354.5		25		19	
North Canterbury:						
Carbetamide 2.2	1	18	39	34	34	42
Carbetamide 3.4	0.25	8	21	32	38	36
Carbetamide 4.5	0	10	2	5	24	32
TCA 4.9/2,2-DPA 0.9	54	123	74	52	4	7
Unsprayed	190.5		33		16	
Canterbury:						
Carbetamide 2.2	9	65	1	6	64	21
Carbetamide 3.4	7	14	1	4	32	44
Carbetamide 4.5	1	12	2	4	52	21
TCA 4.9/2,2-DPA 0.9	36	37	25	28	14	15
Unsprayed	321		13		3	
South Canterbury:						
Carbetamide 2.2	0	9	5	6	12	26
Carbetamide 3.4	0	0	1	tr.	72	55
Carbetamide 4.5	0	0.25	tr.	tr.	59	64
TCA 4.9/2,2-DPA 0.9	171	0.5	22	37	30	11
Unsprayed	465.1		19		5	

*Barley grass—mean number of seed heads per 0.58 m^2 quadrat; ryegrass and clover—% cover, visual assessment.

2.2 kg/ha gives slightly less consistent results. In one of the Manawatu trials and the southern Hawke's Bay evaluation, the spring applications of carbetamide have given a higher degree of barley grass control. It is seen that, following applications of all rates of carbetamide, the percentage cover of ryegrass decreases while the proportion of clover increases. Two each of both the North and South Island sites were in short sheep pastures, while the other two trials were in dairy pastures.

1971-72 Series of Trials

Carbetamide was applied at only two sites during both mid-winter and early spring but at lower rates than in previous evaluations. In both cases the plots were on a sward with a light, even barley grass infestation grazed exclusively by sheep. The same comparative treatment of TCA/2,2-DPA as used in the 1970-1 series was also applied. It is seen that during this season carbetamide has at rates as low as 1.67 kg/ha given satisfactory barley grass control following mid-winter applications, while the early spring applications at this low rate appear to have been less effective. At those rates necessary for satisfactory barley grass control, carbetamide has also reduced the cover of ryegrass while at the same time cover by white clover increased considerably.

TABLE 3: 1971-2 SERIES OF TRIALS—COMPOSITION OF SWARD

Sprayed: Mid-winter applications (M.W.) = mid-July, 1971.
Early spring applications (E.S.) = late August, 1971.
Assessed: Late December, 1971.

Site and Treatment (*kg/ha*)	*Composition of Sward**					
	Barley Grass		*Ryegrass*		*Clover*	
	M.W.	*E.S.*	*M.W.*	*E.S.*	*M.W.*	*E.S.*
Hawke's Bay:						
carbetamide 0.8	3	11	19	25	81	75
carbetamide 1.7	0	6	8	28	92	71
carbetamide 2.5	0	1	tr.	18	100	82
carbetamide 3.4	0	0	tr.	9	100	91
TCA 4.9/2,2-DPA 0.9	0	2	26	46	74	54
Unsprayed	47		30		66	
Marlborough:						
carbetamide 0.8	6	7	18	20	45	51
carbetamide 1.7	0	8	11	22	47	49
carbetamide 2.5	0	0	11	15	55	52
carbetamide 3.4	0	0	6	15	57	51
TCA 4.9/2,2-DPA 0.9	0	0	31	36	36	22
Unsprayed	7		23		46	

*Barley grass—mean number of seed-heads per 0.58 m^2 quadrat; ryegrass and clover—% cover, visual assessment.

DISCUSSION

It is evident from this series of trials conducted over a three-year period and over a wide geographical range, that carbetamide at rates of 2.2 kg/ha applied between mid-winter and early spring gives reasonably consistent

control of barley grass, usually in excess of 90%. It is also evident that ryegrass tolerance is poor to the rates of carbetamide necessary for satisfactory barley grass control. The reduction in ryegrass cover is to a degree compensated for by an increase in white clover cover.

Although the reduction in ryegrass cover reported above and consequent pasture production loss does not support the results of Atkinson (1970), it must be remembered that this author's trial plots were not open to grazing whereas Meeklah *et al.* (1970) have shown that grazing following herbicide applications to barley grass not only increases barley grass control but also the damage to pasture. It is concluded, therefore, that the series of trials reported above, conducted under a wide variety of conditions, confirms the results of Atkinson (1970) as well as Meeklah *et al.* (1970) on barley grass control. However, the observed reduction in ryegrass cover is so great that it is unlikely that carbetamide alone can be used for selective control of barley grass as an all-over pasture application. It could, however, be usefully employed alongside fence lines, gateways, etc., and other areas where ryegrass damage may be acceptable.

ACKNOWLEDGEMENTS

The authors are indebted to S. L. Cranfield and P. C. Watt for technical assistance and to the many farmers who made trial sites available.

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