EFFECT OF CHEMICAL REMOVAL OF BARLEY GRASS ON LAMB GROWTH RATES

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Summary

An area of uniform barley grass (*Hordeum murinum*) infestation, in Waikato, was divided into twenty-four 0.2 ha paddocks. Three chemicals, pronamide, carbetamide and 2,2-DPA, were used to control barley grass and the paddocks were grazed by lambs throughout the summer at two stocking rates. All three chemical treatments reduced the barley grass content of the sward by over 96% and substantially increased lamb growth rates over the summer in spite of a reduction in dry matter production. The growth rate of lambs grazing the barley grass infested control paddocks was severely checked from January through to March. This was associated with a high level of eye damage.

INTRODUCTION

PLOT TRIAL WORK with a number of chemical herbicides applied to pastures has shown that these can give a reasonable measure of control of barley grass (*Hordeum murinum*) but their use is associated with a drop in dry matter production and a change in sward composition (Atkinson, 1970; Meeklah *et al.*, 1970). The drop in dry matter production could occur largely through the removal of the unpalatable barley grass and may be offset in terms of animal production, by the change in sward composition. If this is so, the effect these chemical treatments have on pasture productivity should be assessed via the grazing animal rather than by total dry matter production.

This paper reports the paddock-scale use of three herbicides for barley grass control. The chemicals were assessed for barley grass control and the effects on pasture productivity were measured both by dry matter production and lamb growth rates.

METHOD

An area of about five hectares of moderately uniform barley grass infestation on the property of G. J. Parish at Parawera, in Waikato, was divided into twenty-four 0.2 ha paddocks. Six replicates were formed on the basis of paddock proximity and either pronamide (0.5 kg/ha), carbetamide (2.0 kg/ha) or 2,2-DPA (2.0 kg/ha) was sprayed on complete paddocks within each replicate. Application was made by Landrover boom spray in 135 l/ha of water on August 6 (the pronamide was applied as a split application, 0.4 and 0.2 kg/ha two weeks apart owing to an initial application rate error).

The area had previously received an autumn topdressing of 375 kg/ha 50% potassic superphosphate and was 25 to 50 mm high at the time of herbicide application. Line transects were taken across each paddock a week before treatment.

The area was grazed periodically by adult sheep until set-stocked with shorn lambs in mid-December. These were weighed on two consecutive days prior to the trial, randomized on a stratified weight basis and distributed between the paddocks at two stocking rates (35 and 50 per hectare), giving three replications of each treatment at each stocking rate. The lambs were drenched alternately with thiabendazole and tetramisole for internal parasite control, before release and at each subsequent weighing, and the paddocks were all sprayed with 140 g/ha thiabendazole for facial eczema control on February 24.

TABLE 1: PASTURE COMPOSITION AND BARLEY GRASS CONTROL

	Treatment			
	Control	pronamide	carbetamide	2,2-DPA
% Composition Nov. 11, 1971:				
Ryegrass	28a	32a	13b	32a
Barley grass	15	tr.	1.5	tr.
Other grasses*	42aA	15bB	4bB	4bB
Clover	14bB	54aA	65aA	12bB
Other species†	5	8	19	54
No. barley grass seed-heads/ha (thousands) Feb. 16, 1972:				
Low stocking rate	950aA	8bcB	33bcB	35bB
High stocking rate	887aA	5cB	20bcB	28bcB

*Predominantly *Poa* spp. and *Bromus mollis*.

†At this date predominantly chickweed; later on, mayweed predominated on pronamide and carbetamide paddocks.

TABLE 2: DRY MATTER PRODUCTION (kg/ha), DEC. 13, 1971 TO MAR. 29, 1972

	Treatment			
	Control	pronamide	carbetamide	2,2-DPA
Low Stocking Rate:				
Production				
13/10/71-13/12/71	4970bB	4870bB	3810cB	4800bB
Feed available				
13/12/71	1170abAB	560bcAB	210cB	670abcAB
Production				
13/12/71-29/3/72	3850bcAB	4200 abAB	3030cB	4180abAB
Total DM available over grazing period	5020bAB	4750bcA	3240dC	4850bcAB
High Stocking Rate:				
Production				
13/10/71-13/12/71	6320aA	5050bB	4230bcB	4570bcB
Feed available				
13/12/71	1360aA	270cAB	390bcAB	790abcAB
Production				
13/12/71-29/3/72	4900aA	3980abcAB	3530bcB	3880bcAB
Total DM available over grazing period	8260aA	4240bcdBC	3920cdBC	4670bcBC

Barley grass control was assessed by herbage dissection and seed-head counts made from 40 random 0.145 m² quadrats per paddock (Table 1). Dry matter production was measured by cutting from three cages (each 0.6 m × 0.9 m) per paddock during the grazing period. Feed available at the commencement of the trial was measured from one 0.5 × 6 m strip per paddock (Table 2).

Liveweights were recorded every few weeks and the means for each treatment by stocking rate are shown in Figs. 1 and 2. The lambs were shorn in April when the wool was graded for "quality number," type, character and seed content and the fleeceweights were recorded (Table 3). Eye damage was also recorded at each weighing and is expressed as the percentage of eyes affected (Fig. 3).

TABLE 3: MEAN WOOL WEIGHTS, SEED RATINGS AND WOOL CHARACTER FOR PERIOD DEC. 14, 1971, TO APR. 7, 1972

	Control	Treatment		
		pronamide	carbetamide	2,2-DPA
Wool wt. kg/lamb:				
Low stocking rate*	1.55cdCD	1.93aA	1.90aAB	1.77abABC
High stocking rate*	1.40dD	1.66bcBC	1.51cdCD	1.53cdCD
Wool wt. kg/ha:				
Low stocking rate	54.2	67.5	56.5	62.0
High stocking rate	70.0	83.0	75.5	76.5
Seed rating (0-8 scale)†:				
Low stocking rate	3.77	0.67	1.63	1.08
High stocking rate	5.07	1.29	1.60	1.27
Wool character (1-7 scale)‡:				
Low stocking rate	5.05	5.14	5.14	5.28
High stocking rate	4.83	5.17	4.97	5.10

*Low stocking rate—21 lambs in mean; high stocking rate—30 lambs in mean.

†Seed ratings, 0 = none, 8 = heavy infestation.

‡Wool character, 1 = poor, 7 = excellent condition.

RESULTS AND DISCUSSION

All the chemicals reduced the barley grass content of the sward by over 96%, with pronamide giving 99% reduction, and significantly reduced *Poa* spp. (Table 1). Carbetamide reduced ryegrass (*Lolium* sp.) but both pronamide and carbetamide increased the white clover (*Trifolium repens*) content significantly. However, this use of chemicals increased other weeds, notably chickweed (*Stellaria media*), annual mouse-ear chickweed (*Cerastium glomeratum*) and stinking mayweed (*Anthemis cotula*) to a disturbing level. The trial will be continued to study the duration of the barley grass control and the effects of oversowing as a follow-up treatment.

Dry matter production during the grazing period of the trial was reduced by the herbicides (Table 2). At low stocking rates carbetamide showed a significant 5% reduction while at high stocking rates all chemical treatments showed a reduction. The greater amount of feed available at the commencement of the trial on the control paddocks reflected the sheep's reluctance to graze the untreated areas, even though the barley grass was still in the vegetative stage.

FIG. 1: Mean liveweights of lambs on four pasture treatments (December to April). Low stocking rate—35 lambs/ha (21 in mean).

FIG. 2: Mean liveweights of lambs on four pasture treatments (December to April). High stocking rate—35 lambs/ha (30 in mean).

FIG. 3: Percentage of lambs' eyes damaged on treated and untreated pasture.

During the first month of the grazing period, the lambs on all chemical treatments at both stocking rates gained weight at approximately twice the rate of those on the untreated paddocks (Figs. 1 and 2). This probably represented the effect of the pasture compositional change towards clover dominance and possibly the low palatability of barley grass. From mid-January to the third week in February, the lambs on the treated areas continued to gain well at the low stocking rate. At the high stocking rate, growth slowed on 2,2-DPA treatment from mid-January onwards, and from late January on the other chemical treatments as feed availability declined. The control lambs (untreated paddocks) stopped gaining weight in mid-January and started to lose weight at the higher stocking rate.

After February 18, 1972, the treated areas were becoming overgrazed, a situation exaggerated by summer drought. Under this continuous heavy grazing, the clover-dominant pasture was eaten so short that regrowth was severely checked. This was particularly noticeable in a high-stocked carbetamide paddock exposed to the wind. Meanwhile the control lambs recommenced growth and over the period February 18 to March 23, 1972, were gaining on the others. The control paddocks had not been grazed so short and were more able to recommence growth after heavy rain in early March. Had a more realistic grazing management been employed with adequate spelling, it is probable that the chemically treated paddocks would have maintained better production.

The sudden growth check among the control lambs in mid-January coincided with maximum seed shed of the barley grass and is almost certainly attributable to the physical damage caused by the barley grass seed, especially to the eyes. The liveweight gains of the control lambs were examined on the basis of eye damage on the day of weighing, and the effect is demonstrated in Table 4.

TABLE 4: MEAN LIVEWEIGHT GAIN/LAMB/DAY (kg)
ACCORDING TO EYE DAMAGE

<i>Period</i>	<i>Stocking Rate</i>	<i>No Eye Damage</i>	<i>1 Eye Damaged</i>	<i>2 Eyes Damaged</i>
Jan. 14 to Jan. 28, 1972	L	0.10a (5) *	—0.01a (11)	—0.04a (5)
	H	0.03a (2)	—0.00ab (10)	—0.03b (9)
Jan. 28 to Feb. 18, 1972	L	0.05a (4)	—0.06a (14)	—0.12a (11)
	H	0.05a (3)	—0.00ab (13)	—0.05b (13)

*Number of lambs.

Initially the eye damage recorded was barley grass seed in the eyes but, at later stages, conjunctivitis and keratitis resulting from seed puncture and abrasion of the cornea.

Table 4 probably represents the minimum effect of eye damage on growth rate. The eye damage recorded may have occurred any time during the period between weighings. Those lambs in the "damage" groups which showed positive growth may have increased weight before the damage occurred. Possibly because of this misclassification resulting in intra-group weight variability, the weight losses due to eye damage are not statistically significant at the low stocking rate but the trend is so marked and consistent that the implications are apparent. It is likely that the true effect of barley grass in the eyes is greater than is indicated here.

During late January and throughout February, many of the control lambs were completely blind and were a pitiful sight. However, they demonstrated a remarkable potential for recovery and although at the termination of the trial in April 48% of the control lambs still showed keratitis in both eyes, they were all at least partially sighted. With the shedding or removal of the irritating seed and subsequent improvement in sight, the lambs recommenced growth. However, these data and field observations would suggest that a growth check of 6 to 8 weeks might be expected as a result of barley grass seed in the eyes.

Wool weights were increased significantly by all chemical treatments (Table 3), the increase being as high as 25% with pronamide at the low stocking rate. Wool character also improved as a result of applying the herbicides. In the wool classer's opinion, seed ratings over 3 were associated with sufficient discoloration of the fleece to result in a price reduction for the wool. Thus the wool from the control lambs which had significantly more seed would have been penalized.

The improved growth rate of lambs on all three chemical treatments together with the considerable barley grass control is very gratifying. In spite of a reduction in dry matter production as a result of spraying, there was an increase in meat and wool production adequate to offset the cost of the herbicides and their application at current prices. This disregards any loss of production that may have occurred before measurements commenced. Should oversowing of ryegrass be necessary as a follow-up treatment (a factor under investigation), then the pronamide should still show a profit while the other chemicals might not. Though there are few significant differences between the three treatments, pronamide generally gave the best results. However, trials conducted elsewhere indicate this trend in favour of pronamide may not occur in other parts of New Zealand. Thus the choice of chemical for maintaining stock productivity, while controlling barley grass, must still be regarded as an open question. Nevertheless, this paper gives a clear indication of the benefits to stock and pasture that can arise from herbicide treatment.

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