Cost Benefits of Weed Control

COST BENEFIT OF BARLEY GRASS CONTROL

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Summary

Some data on the cost of barley grass (*Hordeum* spp) in terms of devaluation of sheep products and depression of lamb growth rates is given. This may amount to several million dollars per annum. Treatments to control barley grass showed increased monetary returns from meat and wool of \$64.00 to \$93.00/ha. The treatments cost from \$13.00 to \$31.00/ha and cost/benefits ranged from \$52.00 to \$74.00/ha.

INTRODUCTION

A weed is often defined as a plant growing where it is not wanted. In monoculture crops a weed is any plant other than the crop and its effect can be measured in terms of reduced crop yield though other factors such as interference with harvesting must be considered. The cost benefit of weed control can fairly easily be assessed by comparing the applied cost of weed control with the increased yield after treatment and/or reduced harvesting costs.

Many pasture weeds, however, are controlled because they are there and aesthetically displeasing without any real knowledge of their economic importance or the benefit to be gained from controlling them. Some weeds are toxic, but these are generally avoided by stock, except in periods of extreme feed shortage, some are physically harmful to animals or their by-products, while others may be both palatable and nutritious. The only way to measure the effect of "weeds" in pasture is via the animals that use the pasture since dry matter production does not allow for nutritive or utilization factors.

Barley grass is one weed on which much time and money has been spent with little real knowledge of its effects. Some data have been published on the cost of barley grass and damage to sheep products (Loughnan 1964; Rumball 1970; Shugg and Vivian 1973) but little attempt has been made to equate this to the cost of measures designed to prevent it.

Loughnan (1964) drew attention to the rapid increase in barley grass damage to pelts from less than 0.1% in 1953 to over 20% in 1964. Rumball (1970) estimated barley grass cost the country \$500,000 per annum in lost value of export pelts. Shugg and Vivian (1973) estimated that seeds, mainly barley grass, reduced pelt value by \$500,000 while slipe wool was devalued by \$280,000 in 1972. These figures represent a devaluation of 1.25% over all export pelts or 12.5% on affected pelts as it has been estimated that 10% of the country's lambs were affected by barley grass (Shugg and Vivian 1973). The slipe wool devaluation was equal to 1.0% of total slipe wool value. The New Zealand Wool Board does not consider barley grass a major contaminant of New Zealand clip wool but if the slipe wool devaluation estimate were extrapolated to clip wool the figure for 1972 would have been over \$2 million.

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On a national basis seed contamination of carcasses is low and of little economic consequence to the country. However occasionally lines of lambs are badly affected with 30-70% rejected (Loughnan 1964; Shugg and Vivian 1973).

A major cost of barley grass is through its effect on stock health, particularly of lambs. Trials have shown that lambs exposed to barley grass seed may suffer a reduction in live weight gain during the summer which can be as high as 6-8 kg/lamb depending on the level of barley grass infestation (Hartley and Atkinson 1972; Hartley 1975). Seventy percent of New Zealand's lambs are still on the farms in January.

If 10% of New Zealand's lamb pelts are affected by barley grass it is likely that at least this number have their growth affected by seed since seed in the eyes is the major reason for loss of weight (Hartley and Bimler 1975) and eyes are the first things affected by seed. Ten percent of New Zealand's fat lambs is 4 million lambs. If liveweights were reduced by as little as 1 kg per lamb this would represent a loss of 2 000 tonnes of meat. At 1976 prices this would have cost \$1.4 million in export revenue.

Pelt damage and seedy wool increase while live weight decrease with increasing levels of barley grass in the pasture (Atkinson and Hartley 1972) and in farmers' opinions barley grass is on the increase (Atkinson and Hartley 1976). It is likely, therefore, that losses due to barley grass will also increase.

Some data are available on the annual cost of herbicides applied for the control of barley grass but these cannot be related to the benefit derived since the above economic losses occurred in spite of any control measures that had been taken. Losses might have been higher, had the control measures not been taken.

COST/BENEFITS OF CONTROL

Chemical control

Probably the most comprehensive data directly relating the benefits of barley grass control to the cost of control come from trials conducted by the authors testing herbicide control. The cost/benefit data from one replicated paddock scale trial for the period 14.12.71 to 5.4.72 are shown in Table 1. Costs and prices have been calculated on current prices (April, 1978).

Table 1 shows a considerable increased return from treated pasture in terms of animal products over the summer period. This increase was in excess of treatment costs by between \$51.00 and \$74.00/ha according to herbicide used. Table 1 does not, however, show any loss of production that might have occurred between herbicide application in August and commencement of measurements in December. Subsequent trials have measured dry matter and stock production over the spring period immediately following treatment. Spring dry matter production was reduced on average 30% by propyzamide, 19% by 2, 2-DPA/TCA and 25% by ethofumesate. Stock performance was reduced by 41%, 19% and 18% respectively. However, most of this reduction occurred during the spring flush when there is generally surplus feed. The trials measuring spring production were stocked according to feed available on each treatment, therefore, surplus feed on the untreated paddocks would not have been unused as generally occurs in practice. Had the paddocks all been stocked at farm stocking rates the depression following herbicide treatment might have been less apparent.

There is little doubt that the dominant effect of barley grass is the physical damage caused by the seed to lambs and lamb products. Therefore any treatment that prevents seed production will stop the main adverse effects of barley grass. Apart from herbicides this can be done by topping or grazing.

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TABLE 1: Cost/benefit from three herbicide treatments over period 14.12.71 to 5.4.72 (based on Hartley and Atkinson, 1972).

	Treatment			
	Untreated	Propyzamide	Carbetamide	2,2-DPA
Herbicide (kg/ha)		0.5	2.0	2.0
Dry matter available (kg/ha)	5020 aA	4750 aA	3420 bB	4850 aA
No. barley grass seed heads /m ² Feb.	95	0.8	3.3	3.5
Mean L.W. gain (kg/lamb) (35 lamb/ha)	6	10	10	9
Mean wool wt. (kg/lamb)	1.55 bB	1.93 aA	1.90 aA	1.77 aA
Increase in production resulting from treatment				
L.W. (kg/ha)		140	140	105
Wool (kg/ha)		13.3	12.3	7.7
Value of increased production				
Meat* (\$/ha)		60.20	60.20	45.20
Wool** (\$/ha)	33.30	30.60	19.30	
Total gain (\$/ha)		93.50	90.80	64.50
Cost of herbicide (\$/ha)				
		28.20	13.30	9.70
Cost of application (\$/ha)				
		3.00	3.00	3.00
Total cost (\$/ha)		31.20	16.20	12.70
Cost/benefit of treatment (\$/ha)				
		62.30	74.50	51.80

* meat value 87c/kg dead wt, assuming killing out weight of 50%

** wool value 250 c/kg

Mechanical control

The effect of topping barley grass on lamb growth rates was measured on a four replicate paddock scale trial at Ahuriri, Napier. Paddocks were stocked with weaned lambs from 12.12.75 to 27.1.76. Mean liveweight gains and cost/benefit are shown in Table 2.

Topping once, just before the barley grass seed ripened, was as effective at protecting lambs as repeat topping at the early flowering stage. Both treatments increased returns, as measured by liveweight gains in excess of the cost of topping and showed a cost benefit of \$54.00 to \$68.00/ha. Topping treatment is unlikely to have had any adverse effect on production at other times of the year.

Barley grass seed production can also be controlled by grazing, (Hartley *et al* 1978). Treatments stocked hard in the spring prevented or delayed and reduced barley grass seed production. The hard stocking treatments not only carried more sheep than the farm practice (39

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TABLE 2: Cost benefit of topping treatment over period 12.12.75 to 27.1.76 at Ahuriri.

	Untreated	Topped twice early flowering	Topped once before seeding
L.W. gain (kg/lamb) (30 lamb/ha)	0.1 bA	3.3 aA	3.3 aA
Increased production following treatment (kg/ha)		96	96
Increased value as meat (\$/ha)		83.50	83.50
Cost of topping (\$/ha)		28.00	14.00
Cost/benefit of treatment (\$/ha)		54.50	68.50

(Barley density on untreated paddocks approx. 110 seed head/m²)

wethers/ha as opposed to 29) during the spring but the sheep also gained more weight (15.5 kg each as opposed to 7.5 kg). A similar increase in productivity was shown during the summer with liveweight gain of 1.8 kg/wether as opposed to a loss of 3.1 kg on the treatments under-grazed during the spring. This suggests a very economic method of controlling barley grass seed production to reduce seed damage to stock and increase growth rates over the summer.

CONCLUSION

These results show that, where barley grass infestations are severe, a worthwhile financial benefit can be obtained from control measures. The increased returns obtained from the various treatments give some indication of the cost of barley grass infestation, on a farm basis, as opposed to the national losses previously estimated. If treatments were effective in eradicating barley grass at an early stage of infestation, when it were still possible, the cost benefit could be very substantial. Prevention is better than cure.

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