ALTERNATIVES TO BARLEY GRASS ON STOCK CAMPS

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Summary

A number of grass cultivars capable of responding well to high fertility were grown on a stock camp and their growth under different cutting regimes compared with that of barley grass (*Hordeum* spp). None of the cultivars grew as well as barley grass at first although by the spring all were giving higher yields. Annual grasses are not promising unless the barley grass is sprayed out and the alternative grasses resown each year. Perennial grasses are probably better but only if they are allowed to continue growing through the summer: prairie grass (*Bromus catharticus*) is perhaps the best choice where animal access is limited or prevented altogether.

INTRODUCTION

Stock camps are the classic sites of barley grass infestation in New Zealand. If conditions are suitable it is from these points that barley grass spreads out into the pastures. Clearly then, if barley grass is to be prevented from spreading, its control on stock camps is important. Several authors (Levy 1948; Loughnan 1964; Leonard 1965) have suggested oversowing other grass species in badly infested areas and Baker (1971) discussed different methods of introducing more favourable species. Henderson and Grant (1974) oversowed a number of pasture grasses into a paraquat-treated, barley grass infested pasture and found that only prairie grass, sown at a rate of 230 kg/ha, significantly reduced the barley grass component of the pasture but even this did not reduce the number of barley grass seed heads produced.

Stock camps, however, possess special characteristics. The vegetation and soil surface are regularly disturbed and, as a result of stock defaecation and urination, the levels of soluble salts in the soil are very high, sometimes to the point at which they are toxic to many plant species (Metson *et al* 1971). In the experiment described here the growth of barley grass on a stock camp was compared with that of several grass cultivars which have potentially high rates of growth under very fertile conditions. Stock was excluded from the trial site but different cutting regimes were imposed.

METHOD

In 1973 a stock camp beneath a shelter belt of macrocarpa (*Cupressus macrocarpa*) was fenced off from stock. The vegetation in this area was almost pure barley grass. In October and November 1974, before any seed heads had appeared, the area was sprayed several times with paraquat in order to eliminate barley grass and prevent any seed from being set. The experiment was laid down in April 1975 at which time soil samples were taken and analysed for soluble salt content. The trial site was on Himatangi sand.

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Barley Grass

Nine grass cultivars were sown at the rate of 2000 viable seeds/m² in plots measuring 2 m × 2 m. On 24 April the seeds were broadcast, covered with a light sprinkling of sand, protected from slugs by metaldehyde pellets and from birds by fine plastic netting. The nine treatments were replicated three times, with one replicate being close to the trees and on soil with a high level of salts (0.62% total soluble salts), the next being a little further away (0.48% total soluble salts) and the third replicate further away still on soil containing 0.42% total soluble salts. The grasses used were: barley grass (*Hordeum murinum*), 'Grasslands Tama' Westerwolds ryegrass (*Lolium multiflorum*), 'Grasslands Paroa' Italian ryegrass (*L. multiflorum*), Crop Research Division ryecorn (*Secale cereale*), 'Grasslands Manawa' short-rotation ryegrass (*L. [multiflorum x perenne]*), 'Grasslands Matua' prairie grass (*Bromus catharticus**), 'Grasslands G. 14' phalaris (*Phalaris aquatica*), 'Grasslands Nui', and 'Grasslands Ruanui' perennial ryegrasses (*L. perenne*).

TABLE 1: RELATIVE SEEDLING COUNTS AND DRY MATTER YIELDS OF GRASS SPECIES

	Seedling count	Yield at first harvest on :			
	13.5.75	26.6.75	26.8.75	2.10.75	27.11.75
barley grass*	(1407)	(180.1)	(846)	(1900)	(4100)
	100 ab	100 a	100 ab	100 abc	100 c
'Tama'	59 de	38 c	103 ab	128 a	125 bc
'Paroa'	116 a	12 cd	56 bc	113 ab	194 ab
ryecorn	70 cd	89 ab	97 ab	123 a	164 abc
'Matua'	40 e	70 b	129 a	128 a	134 abc
phalaris	46 de	8 d	46 c	78 c	154 abc
'Manawa'	80 bc	6 d	36 c	84 bc	210 a
'Nui'	81 bc	14 cd	44 c	87 bc	160 abc
'Ruanui'	46 de	5 d	21 c	85 bc	143 abc
CV %	22	41	36	16	28
Total yields over all harvests					
	4 harvests	3 harvests	2 harvests	1 harvest	
barley grass*	(4250)	(3550)	(3140)	(4100)	
	100 a	100 b	100 d	100 c	
'Tama'	110 a	178 a	214 a	125 bc	
'Paroa'	117 a	163 ab	191 ab	194 ab	
ryecorn	91 a	98 b	137 bc	164 abc	
'Matua'	90 a	190 a	165 abc	134 abc	
phalaris	86 a	131 ab	118 cd	154 abc	
'Manawa'	118 a	132 ab	146 bcd	210 a	
'Nui'	127 a	175 a	152 abcd	160 abc	
'Ruanui'	139 a	124 ab	159 abcd	143 abc	
CV %	30	26	22	28	

* Actual count or yield (kg/ha) in parenthesis.

Seedling counts were made in May 1975. Each plot was divided into four quarters and harvests were taken from a 0.5 m² quadrat in the centre of each quarter. There were four harvest dates (see Table 1) and one quarter of each plot was cut on all four dates, one on the last three dates, one on the last two dates, and one only on the last date. Harvested material was cut to a height of about 20 mm above the ground and was then oven-dried and weighed.

Nettle (*Urtica urens*) and chickweed (*Stellaria media*) became a problem after the barley grass had been eliminated and these were controlled when necessary with a mixture of MCPA and dicamba.

* Sometimes known as *B. unioides*.

RESULTS

Seedling counts, total dry matter yields for each cutting regime and dry matter yields at the first harvest for each regime are given in Table 1, all in relation to figures for barley grass. Although not shown in Table 1, there was a marked tendency for dry matter yields to be higher in plots on the less saline part of the experimental area.

Seedling establishment of 'Paroa' and barley grass was good, although that of the latter was not significantly better than that of 'Manawa' and 'Nui' ryegrasses. At the first harvest on 26 June the yield of barley grass was much higher than that of any other grass except ryecorn. In sub-plots not cut until 26 August 'Tama', ryecorn and 'Matua' all gave yields similar to that of barley grass and all four species outyielded phalaris and the perennial ryegrasses. Where the grasses were allowed to grow until 2 October the yield of barley grass was not significantly different from any of the other grasses although 'Tama', ryecorn and 'Matua' outyielded all except barley grass and 'Paroa'. After 5 months' unchecked growth barley grass was significantly outyielded by 'Manawa' and 'Paroa' and in fact had the lowest yield of all.

When four harvests were made during the course of the season there were no significant differences between treatments in terms of total yield. When only three harvests were made barley grass was inferior in total yield to 'Tama', 'Matua' and 'Nui'. With two harvests 'Tama', 'Paroa' and 'Matua' gave greater yields than barley grass.

DISCUSSION AND CONCLUSIONS

In the early stages of growth barley grass grew much more quickly than any of the other grasses but when the plots were not harvested all the others outyielded barley grass. Frequency of cutting had an important effect on relative yields. Barley grass total yields remained fairly constant under all cutting regimes but the yields of the three annual species and of phalaris and 'Matua' tended to decline under frequent cutting. Thus frequent cutting or, on a true stock camp, grazing would tend to favour barley grass in relation to the other species.

No measurements of competitive ability were made in this experiment but it is known from previous work (Cocks 1974; Popay, unpublished data) that part of the reason for the success of barley grass is its rapid germination and early growth in comparison with that of seedlings of other pasture species. The evidence presented here suggests that barley grass would have an initial advantage over any of these species when sown on a stock camp, even though subsequent growth may lead to some suppression. Regular cutting or grazing would probably help barley grass to capitalise on its early advantage so that if barley grass on stock camps is to be replaced, stock must be excluded or controlled.

The annual species tested were sown under fairly favourable conditions, in the absence of barley grass, and yet grew relatively slowly at first. Their only place as alternatives to barley grass on stock camps would be if they were capable of a higher level of self-seeding, or if the barley grass was sprayed out every autumn and the annual species then oversown.

Of the perennial species used, only 'Matua' grew at all quickly at first, although by the end of the experiment all had outgrown barley grass when three or fewer harvests were made. Perennial species, grown from seed, offer rather less chance of replacing barley grass in their first season than do the annual ones. What is needed to eliminate barley grass from stock camps is a perennial grass cover which can survive the summer and grow away quickly in the autumn. The difficulty here is that plants

Barley Grass

on stock camps are exposed to physiological drought because of the high salt levels in the soil: this effect is compounded by actual summer drought, and grazing or disturbing plants whilst under this stress may kill them. Over the 1975-76 summer, in the absence of cutting or grazing, phalaris, 'Matua', 'Ruanui', and 'Nui' survived well and no barley grass had spread into these plots. This summer was cool and wet and the ability of these cultivars to survive over a hot dry summer is not known. Nevertheless it does seem as if these grasses offer the best possibilities for partly controlling barley grass and perhaps, in time, replacing it. Of the four, 'Matua' prairie grass is probably the best choice.

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