THE EFFECT OF DIFFERENT PASTURE CULTIVARS ON BARLEY GRASS INVASION

A.I. POPAY, M.J. HARTLEY and G. CROUCHLEY*

Research Division, MAF, Palmerston North and *Hastings

SUMMARY

The ability of pasture cultivars to resist barley grass (*Hordeum* spp) invasion was examined at a number of sites and over several seasons. The best cultivars often reduced barley grass seed head numbers by more than 80% in comparison with 'Grasslands Ruanui' (*Lolium perenne*). Ellett ryegrass (*L. perenne*), Grasslands 17 cocksfoot (*Dactylis glomerata*) and 'Grasslands Maru' phalaris (*Phalaris aquatica*) were most effective in suppressing *H. murinum* with 'Grasslands Nui' perennial ryegrass and 'Grasslands Matua' prairie grass (*Bromus catharticus*) also showing promise in some trials. Where Mediterranean barley grass (*H. hystrix*) was present, Grasslands 17 cocksfoot was outstanding in reducing growth of this species.

INTRODUCTION

Barley grass invades perennial pastures when the other species are weakened, often by summer drought or over-grazing, so that they are slow to recover in the autumn. This suggests that the use of pasture species which are more persistent during adverse summer conditions and which respond quickly to autumn rainfall could help to reduce the incidence of barley grass.

The vigour and persistence of pasture cultivars depend on several factors, including establishment, climate, grazing management and insect damage. Experiments on the invasion of barley grass into plots of different cultivars were initiated at several sites and at different times and these experiments are described here.

MATERIALS AND METHODS

In all the experiments grass cultivars were sown into prepared ground, with 'Grasslands Huia' white clover (*Trifolium repens*) and in some cases, with 'Grasslands Turoa' Montgomery red clover (*T. pratense*) or Woogenellup subterranean clover (*T. subterraneum*). After establishment the trial areas were grazed with sheep, usually rotationally, although different grazing managements were used in some experiments.

All experiments other than the first described below were carried out on land which was previously in pasture infested with barley grass. Barley grass tended to re-invade the sown plots and in successive summers the barley grass content of each plot was assessed by either visual scoring or by counting barley grass seed heads in a number of small quadrats.

In one experiment, begun in October 1975 at Palmerston North on an area free of barley grass, six grass cultivars were used (Table 1). Plot size was 10 x 2 m and there were 12 replicates of each cultivar. The plots were mown regularly for the first 12 months and all cultivars established satisfactorily. In March 1977, after the trial area had been grazed, 200 barley grass (*H. murinum*) seeds were sown into a 0.5 m² area in the middle of each plot. Barley grass seed heads were counted and removed in December 1977. In April 1978 a further 100 barley grass seeds were sown in the same 0.5 m² area and the barley grass seed heads counted in December 1978.

In another experiment, at Rukuhia, Hamilton, six grass cultivars (Table 2) were sown in May 1975 in 6 x 6 m plots, arranged in six replicates. Establishment of Maru

Pasture Weeds

and S 170 tall fescue (*Festuca arundinacea*) was poor but the other cultivars established well. Barley grass (mostly *H. murinum* but with some *H. leporinum*) invasion was assessed in the second and third summers.

The rest of the experiments were conducted at Ahuriri Lagoon, Napier, on property belonging to the Lands and Survey Department. In the 'estuary block' experiment, nine grass cultivars (Table 3) were sown in March 1977. Plot size was 10 x 10 m and there were five replicates. Barley grass (*H. murinum*) was assessed in the third and fourth summers after establishment.

In the final experiment, at Ahuriri, four replicate plots of 10 grass cultivars (Table 4) were sown in April 1977 in each of five small paddocks (grazing management blocks). Plot size was 5 x 5 m. Initial establishment was poor and plots were reseeded at the same rates by oversowing in the following spring. All paddocks were mob-stocked with sheep as necessary until November 1978, when a different management was imposed on each paddock to see if management affected the invasion of barley grass. The grazing managements used were:—

- Paddock 1: grazed 1 week in every 3 or 4 weeks to leave pasture at 3 cm.
- Paddock 2: mob-stocked when pasture reached 7.5 cm to reduce to below 2.5 cm within 1—3 days.
- Paddock 3: hard set-stocked throughout the year.
- Paddock 4: hard set-stocked in spring and early summer, mob-stocked rest of the year.
- Paddock 5: lax set stocked in spring and early summer, hard set-stocked rest of the year.

Barley grass (both *H. murinum* and *H. hystrix*) invasion was assessed in the second, third and fourth summers after sowing.

For statistical analysis of seed head counts, raw data were transformed by $\log_e(x + 1)$: means of transformed data are presented in brackets in the Tables.

RESULTS

In the Palmerston North trial (Table 1), Maru and Nui were significantly better than all other cultivars in the first year. In the second year, after a serious drought in early 1978, Maru was the best cultivar for preventing barley grass invasion.

At Rukuhia (Table 2), there was no significant difference between Nui and 'Grasslands Ariki' ryegrass (*L. (multiflorum x perenne) x perenne*) but Nui was significantly better than the rest of the cultivars in both years.

On the estuary block at Ahuriri (Table 3) in December 1979, Ellett, Nui, Maru and G17 had the lowest barley grass scores. In January 1981, these same four cultivars contained significantly less barley grass than the other cultivars.

Table 1: Barley grass seed head numbers per 100 seeds sown, in different pasture cultivars at Palmerston North.

Cultivar	Rate (kg/ha)	Barley grass sown	
		23/3/77 Heads counted	5/4/78 13/12/78
Maru phalaris	15	0.7 (0.3)	17 (2.5)
Nui ryegrass	20	0.8 (0.5)	49 (3.8)
Roa tall fescue*	20	4.9 (1.5)	61 (3.9)
Matua prairie grass	25	7.6 (1.6)	104 (4.4)
Ruanui ryegrass	15	9.7 (1.9)	119 (4.6)
Browntop*	5	19.1 (2.2)	142 (4.7)
LSD (5% level)		(0.71)	(0.53)

*'Grasslands Roa' tall fescue (*Festuca arundinacea*); Browntop (*Agrostis tenuis*)

Pasture Weeds

Table 2: Barley grass seed head numbers per m² in different pasture cultivars sown 11 May 1975 at Rukuhia.

Cultivar	Rate (kg/ha)	Date of count	
		3/1/77	29/12/77
Nui ryegrass	20	7 (1.5)	18 (2.9)
Ariki ryegrass	20	14 (2.5)	34 (3.3)
Ruanui ryegrass	20	48 (3.0)	44 (3.7)
Maru phalaris	20	66 (4.0)	54 (3.9)
Manawa ryegrass*	20	43 (3.1)	88 (4.4)
S170 tall fescue	15	111 (4.3)	105 (4.6)
LSD (5% level)		(1.22)	(0.59)

*'Grasslands Manawa' ryegrass (*L. multiflorum* x *perenne*).

Table 3: Barley grass (*H. murinum*) seed head occurrence in different pasture cultivars sown 10 March 1977, estuary block, Ahuriri.

Cultivar	Rate (kg/ha)	Score + 12/12/79	Heads per m ² 6/1/81
Maru phalaris	15	1.8	70 (3.8)
Ellett ryegrass	20	1.6	100 (4.1)
G17 cocksfoot	10	2.8	105 (4.4)
Nui ryegrass	20	2.4	170 (4.8)
Ruanui + crested dogtail*	15 + 2	3.6	354 (5.8)
Ariki ryegrass	15	3.4	380 (5.9)
Browntop	10	5.0	402 (5.9)
Roa tall fescue	20	5.0	501 (6.1)
Ruanui ryegrass	15	4.8	521 (6.2)
LSD (5% level)		1.18	(0.98)

* Crested dogtail (*Cynosurus cristatus*)

+ Visual score on a scale where 0 = on barley grass, 10 = dense, even stand.

In the grazing management blocks, it was not possible to analyse differences between grazing treatments statistically because these were not replicated. However, hard spring grazing tended to reduce *H. murinum* (Table 4). *H. hystris* behaved differently, with the highest seed head numbers appearing in the set-stocked paddocks.

There were no significant interactions between grazing management and cultivars in terms of seed head numbers for either *H. murinum* or *H. hystris* and the order of cultivars was similar under all grazing systems. Seed head data from the five paddocks was therefore combined for statistical analysis, and the results presented in Table 4.

There was no difference in *H. murinum* scores in December 1978. In December 1979 there was no significant difference in *H. murinum* scores between Maru, Ellett, G17, Matua and Nui but Maru and Ellett were significantly better than the rest of the cultivars. In January 1981, barley grass suppression was best in Ellett, G17, Maru and Matua plots, although none of these were significantly better than Roa. G17 was particularly good in its ability to suppress *H. hystris*, being significantly better than any other cultivar (Table 4).

Pasture Weeds

Table 4: Barley grass seed head occurrence in different pasture cultivars sown 27 April 1977, grazing management blocks, Ahuriri. Sowing rates were as shown in Table 3: Matua was sown at 40 kg/ha.

Cultivar	<i>H. murinum</i>		Heads/m ² 7/1/81	<i>H. hystrix</i>	
	Score + 14/12/78	Score + 14/12/79		Score + 14/12/79	Heads/m ² 6/1/81
Ellett ryegrass	2.1	1.6	8 (1.8)	4.9	684 (6.2)
G17 cocksfoot	2.2	1.9	8 (1.9)	2.9	89 (4.4)
Maru phalaris	2.1	1.5	9 (1.9)	4.2	480 (5.9)
Matua prairie grass	2.2	2.0	11 (1.9)	4.9	531 (5.7)
Browntop	2.2	2.3	18 (2.5)	4.9	615 (6.2)
Nui ryegrass	2.1	2.0	23 (2.7)	5.1	649 (6.1)
Roa tall fescue	2.3	2.3	29 (2.4)	5.1	687 (6.2)
Ruanui ryegrass	2.2	2.6	36 (2.9)	5.4	672 (6.2)
Ariki ryegrass	2.3	2.3	36 (3.1)	5.0	602 (6.0)
Ruanui + crested dogstail	2.1	2.4	38 (3.2)	4.7	582 (5.9)
LSD (5% level)	0.31	0.55	(0.62)	0.92	(0.44)
Paddock No. (see text)					
1 rotationally grazed	4.1	3.0	60	3.5	179
2 mob-stocked	1.2	2.2	21	3.0	147
3 hard set-stocked	1.3	1.2	2	7.1	1373
4 set/mob-stocked	1.2	1.4	7	3.9	671
5 lax set-stocked	3.2	2.6	18	5.9	427

+ visual score — see Table 3.

DISCUSSION

In all these trials, the cultivars used were grazed in common. Because of the possibility of preferential grazing of some cultivars, direct comparisons of cultivars are difficult. There is however good evidence that under certain circumstances some cultivars can effectively reduce the incidence of barley grass.

In the earlier experiments at Palmerston North and Rukuhia, when only a few cultivars were tested, Nui performed well. Maru was very good in Palmerston North but, due to poor establishment, did not give satisfactory results at Rukuhia. At Ahuriri, Nui was again good at preventing *H. murinum* invasion in December 1979, but did not do so well the following year. Ellett, G17 and Maru performed very well in both seasons. Matua also did well where it was included.

In some circumstances there can be stock health problems associated with phalaris (Wright *et al* 1981) so for general use in *H. murinum* areas, Ellett and G17 are probably the best cultivars. Where *H. hystrix* occurs, G17 is clearly the best cultivar for reducing infestations.

ACKNOWLEDGEMENTS

Thanks are due to the Lands and Survey Department for use of its land. The following helped in the design, execution and analysis of the experiments:— G.C. Atkinson, K. Bimler, G.A. Douch, T.K. James, R. Pringle, J. Rowland, I.M. Ritchie, D. Singh, P. Sanders, N.B. Smith, M.A. Walwyn. DSIR Grasslands Division supplied some of the seed used.

REFERENCES

- Wright, D.F., Kain, W.M., Hamilton, G.J., Slay, M.W.A. and Luckman, M.S., 1981. The merits of phalaris and ryegrass in Hawkes Bay pastures for animal production. *Proc. N.Z. Soc. Anim. Prod.* 41: (In press).