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Effect of grazing management on the performance of newer pasture cultivars

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Abstract

A pasture containing Concord and Yatsyn ryegrass, 'Grasslands Wana' cocksfoot, 'Grasslands Pawera' red clover and 'Grasslands Pitau' white clover was established in autumn 1987. From spring 1987 this sward was grazed at 2-, 3- and 4-weekly intervals in spring, down to a mean height of 2-3 cm or 5-6 cm in one experiment, while in another trial it was grazed in summer at 3-, 4- and 5- to 7-weekly intervals to a mean residual height of 3-4 cm or 5-6 cm. The longest grazing interval applied in spring or summer increased spring and summer pasture yields for the 3-year period by 51 and 35% respectively, compared with the shortest grazing interval. Lenient grazing in spring or summer increased both spring and summer yields by an average of 16% over 3 years. Lenient spring grazing reduced summer pasture yields by 7% over 3 years, but much of this reduction was the result of a decreased proportion of summer-growing volunteer grasses. Yatsyn- ryegrass -established quickly- and performed well, providing the major contribution to pasture production in these 3 years. Its content in the sward was depressed by frequent spring grazing and infrequent summer grazing, but it was not significantly affected by grazing intensity and it can be recommended as the basic ryegrass in a mixture. The contribution of Concord ryegrass was confined mainly to the first winter and spring. Wana cocksfoot was slow to establish and its content in the sward was increased by frequent spring grazing and lenient spring and summer grazing. Its greater drought tolerance will make it a useful addition to a ryegrass pasture in areas of low summer rainfall. Pawera red clover made only a small contribution to the sward and this declined with time. The effects of summer grazing management differences were mainly confined to that season, but spring pasture management treatments also affected pasture yields and botanical composition in the following summer.

Keywords seasonal pasture grazing management, pasture production, botanical composition, cattle grazing, grazing frequency, grazing intensity, ryegrass, cocksfoot

Introduction

The more persistent and higher producing cultivars selected from small plot mowing trials in the Waikato are evaluated to determine their productive capacity and persistence under a variety of grazing management treatments.

In a recent evaluation, cattle grazing intensity treatments were applied throughout the year (Goold & Weeda 1985). Other pasture management research showed that the effect of grazing intensity differences on ryegrass *(Lolium* perenne L.)/paspalum (*Paspalum dilatatum* Poir.) pasture varied for different seasons of the year (Weeda & During 1987). For this reason, the effect of seasonal grazing management differences on pasture mixtures of the newer cultivars was studied.

A combination of the more persistent and high producing ryegrass and cocksfoot cultivars with a summer-active legume was considered to be a very suitable pasture for both dairy and beef production.

As trial work at Rukuhia showed that Yatsyn ryegrass *(Lolium* perenne L.) was higher producing than Ellett ryegrass (Weeda 1989), it was taken as the basic ryegrass for this pasture mixture. Concord ryegrass *(Lolium multiflorum* Lam.) was included to increase winter and early spring production, particularly in the first year, as recommended by Goold (1985). To provide some extra summer pasture production, in case of drought, 'Grasslands Wana' cocksfoot *(Dactylis glomerata* L.) and 'Grasslands Pawera' red clover *(Trifolium pratense* L.) were also added. It was also considered that the inclusion of Wana cocksfoot, which is endophyte-free, may reduce any possible incidence of ryegrass staggers.

With this combination of high producing pasture cultivars, it is important to encourage the growth of

the appropriate cultivars at the right time by judicious pasture management. As Concord ryegrass is reputed to be susceptible to Argentine stem weevil attack and the larvae are able to transfer to tillers of other grass cultivars in the sward (Thorn & Prestidge 1988). management that encourages tillering in grasses may be able to reduce the impact of Argentine stem weevil on pasture production and increase the longevity and productivity of these pastures (Hunt *et al. 1988).*

This paper describes the preliminary results of an evaluation of seasonal differences in grazing frequency and intensity on a newly established pasture containing Concord and Yatsyn ryegrass/Wana cocksfoot, Pawera red clover and 'Grassland Pitau' white clover (*Trifolium repens* L.).

Materials and Methods

Pastures, grazing treatmedts and trial design

On areas where the existing pasture had been killed with glyphosate in early April 1987, the following species were direct drilled on 15 April: Yatsyn ryegrass (at the rate of 11.1 kg/ha), Concord ryegrass, Wana cocksfoot and Pawera red clover (each at the rate of 5.6 kg/ha) and Pitau white clover (at 2.2 kg/ha).

From spring 1987, this pasture was spring grazed at 2-, 3- and 4-weekly intervals, grazing hard (2-3 cm post-grazing pasture height) or leniently (5-6 cm height).

In another trial, from summer 1987-88, pasture was summer grazed at 3-, 4- and 5-to 7-weekly (5 wks in early summer, 7 wks in late summer) intervals, grazing hard (3-4 cm post-grazing pasture height) or leniently (5-6 cm height).

All treatments were replicated 4 times. Treatment periods usually lasted for 12 weeks, but in the first year the spring treatment period was only 8-9 weeks. Outside the treatment periods all plots in each trial were grazed at a common rotation length, generally to a post-grazing pasture height of 4-6 cm, but a little lower in winter.

Plots (0.02-0.025 ha) were grazed with 1- or 2-year-old dairy-beef steers and each trial was grazed within 1 or 2 days.

Pasture measurements

In eight areas of 30 x 15 cm in each of 4 paddocks, grass tillers and red clover plants and shoots were counted in June 1987 and again in June 1988.

To evaluate the persistence of Concord ryegrass, 40 Concord and 40 Yatsyn ryegrass plants were indentified and tagged in early winter 1987; pasture production was measured with pre- and post-grazing cuts using sickle bar and reel mowers.

Pasture production was measured by cutting to 3 cm two areas of 2.5 x 1.2 m, one in each half of the plot, before and after grazing with a Bucher sickle bar mower. As some of the spring grazing treatments were grazed to a height of 2-3 cm it was necessary to measure pasture production from a lower base height. For these treatments an area of 2.5 x 0.5 m within the area mown with the sickle bar mower was cut with a reel mower at a height of 2 cm and the post-grazing cuts were done with the reel mower only. In summer treatments grazed to 3-4 cm, 2 areas were trimmed in each plot with the sickle bar mower to a height of 3 cm after each grazing and pasture production was measured there before the next grazing.

After the treatment periods, pasture production was measured for at least another 3 months with the sickle bar mower on areas trimmed with that mower after the previous grazing, to assess after-effects of the grazing treatments,

Pasture botanical composition was measured by herbage dissections at the start and finish of each treatment period and again about 3 months after treatments ended. Except for an additional dissection in July 1990, the ryegrass was not separated into cultivars.

Twenty post-grazing pasture height measurements were taken in each plot to ensure that the plots were grazed to the correct mean height.

Site, soil type and fertiliser applications

The spring grazing trials were on Horotiu sandy loam and the summer grazing trials on Hamilton clay loam, at a site 13 km south of Hamilton.

The site was topdressed annually in autumn with 15% potassic superphosphate at an average rate of 400 kg/ha.

Results

Plant observations and tiller density in the early stages of the trial

In June 1987, mean tiller density was 1840 per m^2 of which 25% were Concord ryegrass, 67% were Yatsyn ryegrass and 8% were Wana cocksfoot; red clover seedling density was 86 per m^2. In June 1988, tiller density had increased to 3310 per m^2, with no identifiable Concord ryegrass tillers, 85% Yatsyn ryegrass and 15% Wana cocksfoot tillers; there were 19 red clover plants with a total of 174 shoots per m^2.

The percentage survival of the marked Concord and Yatsyn ryegrass plants is shown in Figure 1, together with the total tiller number of the 40 marked plants of each cultivar until January 1988. Later plant observations showed that in late March 1988 the percentage of surviving plants was 85% for Yatsyn and 22% for Concord and by August 1988 it was further reduced to 80% and 12% respectively. The herbage dissection at July 1990 showed a Concord type ryegrass content of 3.5%.

Spring grazing treatments

Harder spring grazing had little effect on the ryegrass content (percentage of DM), but it reduced the cocksfoot content and increased the proportion of summer growing volunteer grasses, mainly summer

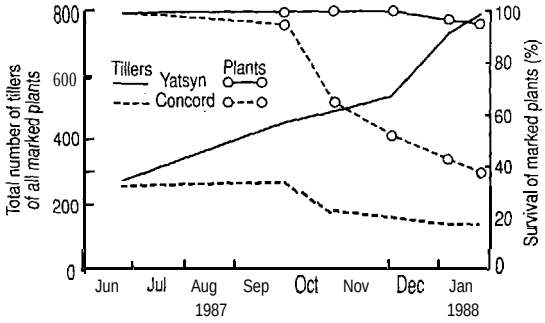

Figure 1 Number of tillers and percentage of surviving plants of marked Concord and Yatsyn **ryegrass** plants.

grass (*Digitaria sanguinalis* L.), *Panicum* species and paspalum, in the following summers. Harder spring grazing reduced spring pasture yields in each year, but increased pasture yields in the following summer.

More frequent spring grazing reduced the **ryegrass** content and increased the cocksfoot content in the sward in late summer in 1989 and 1990.

Spring pasture production was reduced each year by more frequent grazing, In summer 1987-88, pasture production after 2-weekly spring grazing was higher than after **3-weekly** and **4-weekly** spring grazings, but this effect was not repeated over the next 2 summers.

White clover tended to be encouraged by harder and more frequent grazing, with at times significant differences and interactions (not shown in Table 1).

The red clover content declined from an average value of 13% in summer 1987-88 to 2% in summer **1989-90.** It tended to be more abundant after lenient spring grazing but this trend failed to reach significance.

Summer grazing treatments

Hard summer grazing had no significant effect on the **ryegrass** content of the sward, but in late summer it increased the growth of summer growing volunteer grasses in 1989 and in 1990 and reduced the red clover content in 1989 and the cocksfoot in 1990.

Hard summer grazing reduced pasture yields in summer, with no significant carry over effect into autumn.

More frequent summer grazing increased the **ryegrass** content in 1988 and in 1990, and also reduced the weed content, which consisted mainly of dandelion *(Taraxacum officinale* L.), in late summer 1988 and in late autumn 1989.

The difference in summer pasture production between grazing **5-** to 'I-weekly intervals in summer decreased pasture yields significantly in all 3 summers. In each year these effects **were** confined to the treatment period.

Table 1 Effect of spring grazing treatments (only **herbage** dissection results that showed statistically significant differences are included).

Treatments	Grazing interval			(LSD)	Grazing height		(LSD)
	2 wk	3 wk	4 wk	'5%'	2-3 cm	5-6 cm	'5%'
Pasture production (kg DM/ha/day)							
7/10-10/12/87[1]	34.8	46.8	59.3	7.31	44.6	49.4	5.97
11/12/87-8/3/88	49.5	42.9	40.9	5.86	45.6	43.3	4.79
14/3-21/6/88	18.8	18.3	19.1	3.03	18.4	19.1	2.47
27/6-30/8/88	20.4	22.7	21.2	2.86	21.8	21.0	2.33
31/8-22/11/88[1]	44.6	54.7	64.9	4.30	49.4	60: 1	3.51
24/11/88-20/2/89	57.0	58.9	56.8	7.07	59.4	55.7	5.78
6/9-27/11/89[1]	49.6	66.0	71.2	3.94	58.0	66.5	3.22
29/11/89-6/3/90	43.1	45.1	41.6	3.99	45.4	41.1	3.26
Ryegrass content (% of DM)[2]							
16/2/89	33.4	37.9	42.8	7.83	36.3	39.8	6.41
19/1/90	37.4	45.1	51.6	7.18	45.4	44.0	5.86
6/3/90	35.7	42.2	47.6	9.48	40.0	43.7	7.74
Cocksfoot content (% of DM)							
2/1/88	5.00	3.38	5.13	3.29	2.92	6.08	2.68
8/3/88	3.75	5.50	5.88	3.11	3.75	6.33	2.54
16/2/89	21.4	14.5	15.5	7.44	13.8	20.5	6.07
27/11/89	12.1	6.4	4.9	5.41	3.7	11.8	4.41
19/1/90	16.9	4.4	8.4	4.76	6.2	13.6	3.89
6/3/90	22.4	12.3	12.5	6.27	9.3	22.2	5.11
Summer grasses (% of DM)							
8/1/88	6.38	6.13	0.63	4.94	7.67	1.08	4.03
8/3/88	32.0	38.0	27.5	13.55	40.2	24.8	11.08
16/2/89	8.0	13.4	12.6	7.81	15.2	7.4	6.37
19/1/90	4.3	7.1	4.0	5.50	8.1	2.2	4.50
6/3/90	19.9	25.0	19.1	8.40	29.1	13.6	6.84

[1] Treatment period

[2] Only shown for dates with significant differences

Table 2 Effect of summer grazing treatments.

Treatments	Grazing interval			(LSD)	Grazing height		(LSD)
	3 wk	4 wk	5-l wk	5%	3-4 cm	5-6 cm	5%
Pasture production (kg DM/ha/day)							
23/1 l/87-22/2/88'	32.6	37.4	44.4	6.39	36.5	39.8	5.22
24/2-16/6/88	23.9	21.4	24.7	4.54	22.2	24.5	3.71
26/6-29/9/88	42.0	40.1	40.8	5.65	40.4	41.6	4.60
8/12/88-27/2/89[1]	40.9	44.7	58.7	6.09	45.6	50.6	4.97
2/3-6/6/89	31.0	32.2	32.0	5.08	30.4	33.0	4.15
7/12/89-26/2/90[1]	34.8	31.4	43.5	5.48	31.6	41.5	4.48
Ryegrass content (% of DM)							
27/2/89	49.1	39.1	36.4	8.01	43.4	39.7	6.54
6/6/89	70.3	68.8	59.4	8.44	65.8	66.5	6.88
26/2/90	52.0	53.6	41.6	10.53	49.8	48.3	8.59
Cocksfoot content (% of DM)							
22/2/88	0.63	2.38	2.00	1.24	1.75	1.58	1.01
26/2/90	5.2	8.1	11.1	4.56	4.8	11.5	3.72
Red clover content (% of DM)							
27/2/89	3.7	8.5	12.8	7.18	4.5	12.2	5.86
26/2/90	1.62	4.25	6.63	3.50	3.00	5.33	2.86
Summer grasses content (% of DM)							
22/2/88	32.5	26.3	20.0	16.15	27.3	25.2	13.19
27/2/89	13.5	17.9	20.1	5.69	19.8	14.5	4.65
26/2/90	23.7	18.5	15.1	9.25	24.0	14.3	7.54
Weeds content (% of DM)							
22/2/88	9.6	11.2	19.6	6.93	14.6	12.4	5.65
6/6/89	4.63	3.00	9.25	3.07	6.00	5.25	2.51

[1] Treatment period

White clover content was unaffected.

The total content of volunteer grasses and weeds reached a maximum in late summer, with an average value of 40% in 1988, 29% in 1989 and 25% in 1990.

Discussion

The effects of summer grazing management differences were confined largely to summer, but the influence of the spring grazing treatments extended into summer and perhaps beyond.

Hard grazing for the whole 3-month spring period appears inadvisable: it reduced spring pasture production and decreased cocksfoot content in the following summer, at a time when the cocksfoot content should be at its maximum to provide extra herbage in case of a dry summer. Research by Matthew (1990) suggests that if harder grazing is delayed until ryegrass seed-heads start to flower, ryegrass will produce more tillers and more summer feed. Matthew et *al.* (1989) suggested that for maximum summer production from ryegrass pasture, the ideal grazing management would be lax grazing before flowering to allow some seed-head formation, followed by hard grazing to remove the seed-heads and encourage the numerous young tillers at that time.

The increased summer pasture production after harder spring grazing was largely summer-growing volunteer grasses. A similar effect occurred in an adjacent experiment on older Ellett ryegrass/Pitau white clover pasture, where the same grazing intensity treatments were used (unpublished data) and again the increased pasture production came largely from summer growing volunteer grasses.

A reduction in the ryegrass content of the sward by more frequent spring grazing was also reported by Bryant & L'Huillier (1986) when comparing the effect of an 8-day and 32-day spring grazing rotation on pasture botanical composition in October.

More frequent spring grazing kept pasture heights at a lower level, which could have given the cocksfoot a better chance to compete with the ryegrass in the sward, resulting in a higher cocksfoot content and a lower ryegrass content in the following summer. In the cattle grazing experiment of Goold & Weeda (1985), the cocksfoot content of the sward was increased by more lenient grazing, which effect also occurred under the more lenient grazing in spring and summer in the experiments described here.

Lenient summer grazing increased the cocksfoot and red clover content and reduced the summer grass content in the sward in late summer, but it did not affect the ryegrass content. In a nearby experiment, where the same grazing. intensity treatments were imposed on an older Ellett ryegrass/Pitau white clover pasture, the ryegrass content was raised by lenient summer grazing (unpublished data), perhaps because there was no cocksfoot or red clover to compete with it.

Conclusions

1. Yatsyn ryegrass established quickly and performed well, providing the major contribution to pasture production in these 3 years. Its content in the sward was depressed by frequent spring grazing and infrequent summer grazing, but it was not significantly affected by grazing intensity. It is recommended as the basic ryegrass for a mixed pasture.

2. Concord ryegrass showed good growth in the first winter and spring, but at the sowing rates used its contribution after the first year was minimal. This should be kept in mind when including it in a seed mixture.

3. Wana cocksfoot was slow to establish and was more vulnerable to harder grazing than Yatsyn ryegrass. Its content in the sward was increased by more frequent spring grazing, less frequent summer grazing and more lenient spring and summer grazing. Its greater drought tolerance will make it a useful addition to the pasture sward in areas of low summer rainfall.

4. Pawera red clover made only a small contribution to the sward, and this is declining. Under Waikato conditions its inclusion in a seed mixture does not appear worthwhile.

5. Pitau white clover was least affected by the grazing treatments and it has performed well under a variety of circumstances. It is recommended as the preferred legume for this pasture.

6. This sward with the newer cultivars in a more complex mixture is more sensitive to changes in grazing management than an older established Ellett ryegrass/Pitau white clover pasture.

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