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# SEARCHING FOR AN ALTERNATIVE WAY TO MANAGE PRAIRIE GRASS

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Abstract

The performance of 'Grasslands Matua' prairie grass was compared under lax and hard grazing by sheep Pasture utilisation and tiller densities were measured to determine if increasing utilisation would result in sward decline

Lax grazmg permitted sward persistence but resulted in only 56% pasture utilisation Hard grazmg at 75% pasture utilisation resulted in less total herbage harvested, owing primarily to sward decline. Nevertheless, it was shown that hard grazmg can improve pasture utilisation without affecting sward persistence if grazmg is delayed until new replacement tillers have appeared This allows significantly greater pasture utilisation than lax grazing and maintains prairie grass tiller density,

Keywords: *Bromus willdenowii* Kunth. grazing intensity, pasture persistence, tiller appearance. Matua prairie grass

## INTRODUCTION

Both the value of prairie grass as a winter active pasture species and its requirement for lenient grazing have been recognised since early this century (Hill 1915). 'Grasslands Matua' prairie grass (*Bromus willdenowii* Kunth) is a New Zealand bred cultivar superior in agronomic performance to previous uncertified lines. Under grazing, Matua has shown higher annual production than ryegrass and is most dominant in production during winter (Wilson 1977; De Lacy 1987).

Initially Matua was proposed as a cultivar suitable under high fertility for lax rotational grazing (Rumball 1974). While rotational grazing has enabled Matua to persist, lax grazing has often resulted in low pasture utilisation. Recent recommendations have been to graze more Intensively to improve utilisation (Matthews 1986).

However, under some conditions Matua production and tiller numbers have declined under intensive mowing or grazing (Baars & Cranston 1978; Pineiro 8 Harris 1978). Observations of the relatively low tillering capacity of prairie grass and often lengthy time between defoliation and new tiller appearance suggest that tiller numbers may be limiting persistence or productivity. It is therefore possible that we can improve grazing management by using some physiological criteria before defoliation. This paper investigates the possibility of using different growth stages of Matua as a means of determining when to graze.

## MATERIALS AND METHODS

### Site

The experiment was conducted on the Pastures and Crops Research Unit at Massey University, Palmerston North on a Tokomaru silt loam.

### Establishment

The experimental area was sown in March 1986, after a brassica crop the previous summer. The seed mixture included Matua prairie grass (40 kg/ha), 'Grasslands Pawera' red clover (6 kg/ha) and 'Grasslands Pitau' white clover (3 kg/

ha). A dressing of 250 kg/ha potassic superphosphate (15%) was applied after sowing. The sward was allowed to establish over winter with only one light grazing in July.

### Treatments

A randomised complete block design with 4 replicates and plot size of 450 $m^2$ was used. Three grazing treatments with sheep were compared. Grazing of the sward began at 40005000 kg DM/ha and was discontinued at a residual of 2000 kg DM/ha (Lax) or 1000 kg DM/ha (Hard 1). The third treatment was also initiated at 40005000 kg DM/ha, but only when new replacement tillers had appeared at the base of the sward then grazed to a residual of 1250 kg DM/ha (Hard 2). Grazing began in October for the Lax and Hard 1 treatments and in November after new tiller emergence for the Hard 2 treatment. From May 1987, all plots were grazed on a common basis (Hard 2).

### Measurements

Twelve 200 $cm^2$ fixed quadrats were placed in each plot before differential grazing began. Beginning in October, one quadrat was removed to the laboratory every 35 days to provide data on tiller numbers and reproductive state.

Apparent pasture utilisation was measured with pre- and post- grazing cuts with hand shears to ground level, 0.2 $m^2$ per plot. Samples were bulked and dissected for species composition and dry matter.

## RESULTS

Percentage pasture utilisation and herbage harvested for the differential and common grazing periods are shown in Table 1. During differential grazing (October 1986 - May 1987) the Hard 2 treatment resulted in the highest prairie grass intake. Utilisation % was significantly higher (65.7%) with the Hard 2 treatment than with the Lax treatment (50.3%). Despite receiving one fewer grazing, more prairie grass was harvested in the Hard 2 (11 900 kg DM/ha) than in the Lax treatment (9160 kg DM/ha). The contribution of the other species (mainly *Poa* spp. and ryegrass) was signifjcantly'lower in the Hard 2 plots, reflecting a high population density of prairie grass. Although utilisation % of the pasture in the Hard 1 plots was high (68.6%) the amount of herbage harvested was lower than in the other two treatments. This decrease in herbage production reflected a declining prairie grass population.

Table 1 Pasture utilization percentage and harbage harvested (kg/DM/ha) during differential and common grazing

| Treatment | Number of grazings | Prairie grass | Red clover | White clover | Other species | Total | % pasture util. |
|---|---|---|---|---|---|---|---|
| | Differential grazing October 1986–May 1967 | | | | | | |
| Lax | 4 | 9160 | 1750 | 270 | 2060 | 13240 | 50.3 |
| Hard 1 | 3 | 6750 | 2240 | 240 | 2970 | 12200 | 60.6 |
| Hard 2 | 3 | 11900 | 1230 | 160 | 760 | 14070 | 65.7 |
| LSD ($P<0.05$) | | 2920 | NS | NS | 1130 | NS | 11.1 |
| | Common grazing May 1987–November 1967 | | | | | | |
| Lax | 4 | 3660 | 730 | 440 | 100 | 4950 | 51.4 |
| Hard 1 | 4 | 1940 | 1460 | 440 | 1160 | 5020 | 58.9 |
| Hard 2 | 4 | 4600 | 960 | 260 | 200 | 6020 | 59.0 |
| LSD ($P<0.05$) | | 1070 | NS | NS | 690 | NS | NS |

Table 2: Mean Matua tiller density October 1966 - November 1967 (Tillers/m$^2$)

| Treatment | Vegetative Tillers | Reproductive Tillers | Total Tillers |
|---|---|---|---|
| Lax | 1040 | 310 | 1350 |
| Hard 1 | 400 | 160 | 580 |
| Hard 2 | 1270 | 370 | 1640 |
| LSD ($P<0.05$) | 200 | 80 | 230 |

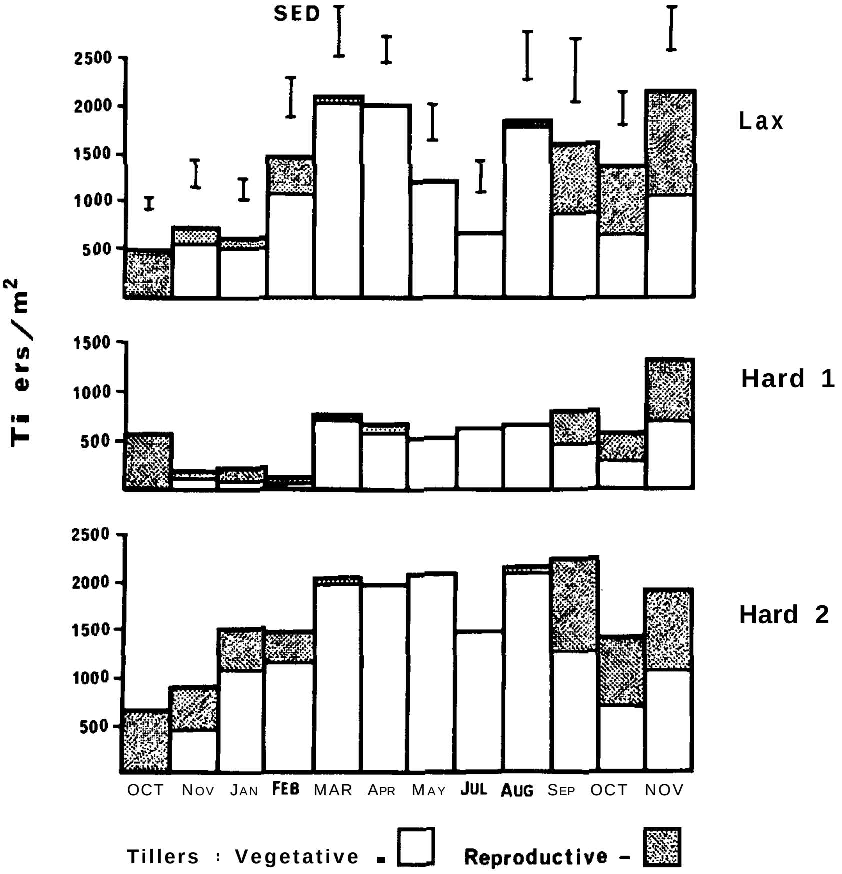


Figure 1: Matua prairie grass tiller density October 1986 - November 1997. SED for tiller totals.

There was no significant difference in the total amount of herbage removed between any treatment. Dry matter production of red clover and other species compensated for declines in prairie grass production. During the common grazing period (May 1987 - November 1987) the greater tiller density of prairie grass present in the Hard 2 treatment did not increase total herbage harvested.

The prairie grass tiller populations (Fig. 1) show similar trends to the herbage removal figures. Under Hard 1 grazing, tiller numbers fell below those of the Lax treatment and at most sampling dates were significantly lower than tiller numbers under Hard 2 grazing. The tiller populations of Hard 2 and Lax treatments were similar. However Hard 2 plots did have an advantage in tiller numbers at some sampling dates, This advantage resulted in Hard 2 grazed plots having a significantly higher tiller population than Lax or Hard 1 plots when tiller numbers over the entire experiment were compared (Table 2).

Persistence, as indicated by tiller density, was not affected by hard grazing if grazing was applied, as in treatment Hard 2, only when new replacemer tillers were present (Fig. 1, Table 2). Maintaining Matua density in this manner significantly reduced the ingress of unsown species and increased tillers numbers during winter (Table 1, Fig. 1).

## DISCUSSION

The persistence and component production of Matua pastures can be increased by strategic management based on the physiological state of the sward (Fig. 1, Table 1). Hard grazing restricted to those periods when new tillers were present increased the amount of prairie grass harvested (Table 1) and increased tiller density (Fig. 1). The decrease in tiller numbers and herbage harvested in the Hard 1 treatment confirmed the original observation that Matua prairie grass is susceptible to overgrazing (Rumball 1974).

It may be argued that the Lax treatment was disadvantaged by the change in grazing management in May 1987. Sellars (1988) has noted that the occasional hard grazing will reduce tiller numbers in laxly grazed. Matua pastures. This decrease in tiller numbers may depend on the severity of the change in management. In a mixed sward, Matua has still contributed well to total production when management shifted from rotational grazing to set stocking in winter (Lancashire 8 Brock 1983). At the start of this experiment, the Hard 2 treatment was effectively changed from a lax to a hard grazing regime. Tiller numbers did not decline at that time. Further research is necessary to define the physiological state at which the density of prairie grass will not decline in response to a change in grazing management.

L'Huillier et *al.* (1986) described prairie grass as having a greater proportion of its leaf in the upper sward horizons than ryegrass, with the result that apparent intake was higher. Hard grazing when new tillers emerge may serve to increase residual leaf area in the lower sward horizon. An increase in residual leaf area could increase regrowth and tillering after grazing.

Hill & Pearson (1985) found that further tiller production depends on attaining sufficient leaf area to maintain a positive carbon balance. The contribution of the replacement tillers towards a positive carbon balance remains to be quantified. However, this would support the result in Table 2 where the Hard 2 treatment had significantly more tillers.

Previous failures with Matua prairie grass may be due to a lack of detailed agronomic studies and definition of specific management requirements. Grazing management based on physiological state has proven well founded for other species. For example, Reynolds & Smith (1962) found that the recovery of bromegrass (*Bromus* **inermis)** after cutting depended on shoot carbohydrate reserves. An indication of increasing carbohydrate levels was new tiller appearance. Similarly, Janson (1978) proposed that grazing of lucerne (Medicago sativa) should start only after basal shoots had appeared. The duration of grazing must permit these basal shoots to remain undamaged and then sufficient spelling allowed for regrowth.

## CONCLUSIONS

The results of this experiment suggest that utilisation and tiller density of Matua prairie grass can be improved. Grazing management following a pattern similar to that recommended for lucerne seems to work well for prairie grass. This requires allowing replacement tillers to appear and then grazing to the height of these new tillers. Further research is needed on the growth dynamics of relatively new pasture species if their potential is to be fully exploited.

REFERENCES


Baars, J.A.; Cranston, A 1978. Performance of Grasslands Matua prairie grass under close mowing in the central North Island. *Proceedings NZ* Grassland Association 39: 139.47.

De Lacy, H. 1987. Ryegrass not good enough for Canterbury farms. *NZ Journal of agriculture, March:* 12-l 3.

Hill. W.S. 1915. Prairie-Grass. *NZ journal* of agriculture *10:* 313-18.

Janson, C.G. 1978. Studies on duration of grazing and defoliation in lucerne. PhD thesis. Massey University.

Lancashire, J.A; Brock, J.L. 1983. Management of new cultivars for dryland. *Proceedings NZ Grass/and* Association 44: 61-73.

L'Huillier, P.J.; Poppi, D.P.; Fraser, T.S. 1986. Influence of structure and composition of ryegrass and prairie grass-white clover swards on the grazed horizon and diet harvested by sheep. Grass and forage science 4 *1:* 259-87.

Matthews, P.N.P. 1966. Matua prairie grass: Changes in approach. Matua prairie grass. Massey Farm Series 3: 12-14. Massey University.

Pineiro, J.; Harris, W. 1978. Performance of mixtures of ryegrass cultivars and prairie grass with red clover cultivars under two grazing frequencies *NZ journal of agricultural research 23: 339-46.*

Reynolds, J.H.; Smith, D. 1962. The trend of carbohydrate reserves in alfalfa smooth bromegrass and timothy grown under various cutting schedules. Crop *science: 333-36.*

Sellars, M.D. 1988. Manawatu dairy farmers experiences with Matua prairie grass. Proceedings *NZ* Grassland *Association 49:* 185.86.

Rumball, W. 1974. 'Grasslands Matua' prairie *grass (Bromuscatharticus Vahl). NZ journal of experimental agriculture 2:* l-5.