THE USE OF GRAZING PRESSURE TO MANIPULATE THE BALANCE OF PASPALUM/RYEGRASS-BASED PASTURE

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Abstract

Three trials in the Waikato and Northland examined the effects of applying a range of grazing pressures at various times of the year on mixed pastures of ryegrass (*Lolium perenne*), paspalum (*Paspalum dilatatum*), and white clover (*Trifolium repens*). The effect of lax grazing or hay and silage making in spring was to reduce paspalum content in the immediate following summer, with an associated increase in ryegrass content. These effects persisted for at least 12 months. Lax grazing with sheep in each season increased paspalum content. Lax summer grazing with sheep and very hard summer grazing with cattle increased paspalum and decreased ryegrass content. The latter effect was thought to be due to pulling of ryegrass. Some practical aspects of the results are discussed.

INTRODUCTION

A RECENT survey indicated that paspalum (*Paspalum dilatatum* Poir.) is present as a major species in large areas of farmland in the Auckland province, and as a minor species throughout much of the remainder of the North Island and the north-western South island (Percival, 1977). Spring and autumn temperatures in the warm zone of New Zealand are close to optimal for growth of temperate grasses (Mitchell, 1956) . Summer temperatures are supra-optimal for ryegrass (Baars and Waller, 1979), but allow for substantial growth of tropical grass (Taylor *et* al., 1976). Thus a mixed pasture containing both paspalum and ryegrass may utilize the environment more efficiently than that based on either component alone. Studies in the Waikato (Baars *et al.,* 1976; Karlovsky, 1959) and Northland (Percival, *et al., 1979)* showed that when paspalum was combined with perennial ryegrass and white clover, total dry matter production was greater than from ryegress/white clover pastures. This can only occur provided neither species becomes dominant at the expense of the other. There is little information on how to manipulate the ryegrass and paspalum balance throughout the year by grazing management.

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The studies reported in this paper were designed to provide guidelines to the management of paspalum in mixed pastures. They were conducted in the Waikato and Northland.

EXPERIMENTAL

EXPERIMENT 1 (W. C. Weeda)

The trial was sited on Horotiu sandy loam near Rukuhia, 15 km from Hamilton. The area was sown in 1975 with 'Grasslands Nui' perennial ryegrass, Commercial paspalum (Australian origin), 'Grasslands Huia' white clover and 'Grasslands Pawera' red clover. A time X severity of grazing trial commenced in August 1977. Ten hard grazing treatments were applied (grazed to 1.5 cm) in various combinations within and between seasons using yearling or two-year-old Friesian steers. In addition, two treatments involved hard winter grazing followed by late spring and early summer silage and hay cuts. A control treatment received medium grazing intensity throughout the year (grazed down to 3 to 4 cm). All treatments were under medium grazing intensity when not receiving their specific management. The botanical composition was determined from individual pre-grazing cuts to ground level.

*EXPERIMENT 2 (J. A. Raars and G. J. Goold)

This trial was sited on Hamilton clay loam near Rukuhia. An area was sown in 1975 with the same seed mixture used in Experiment 1. The following grazing managements were applied from August 1977 using sheep:

(1) Lax grazing (to 6 cm) for the whole year.

(2) Hard grazing (tc 3 cm) from mid-October to late December then lax grazing until April, followed by alternate hard and lax grazings (late spring to mid-summer).

(3) Hard grazing from mid-August to December, followed by lax grazing (early spring to early summer).

(4) Hard grazing from late October until early March, followed by lax grazing (late spring to autumn).

Rotation length was 18 days in spring and summer, except during the summer drought of 1977-8 when the rotation was 36 days. A 36-day rotation was used for late autumn and winter. Pasture composition was measured by pre-grazing cuts to ground level.

EXPERIMENT 3 (N. S. Percival)

The trial was sited on Kiripaka silt loam at Kaikohe. The pasture used was a mixed sward at least 20 years old, which was paspalum-dominant in summer and early autumn and ryegrass-dominant for the rest of the year. Grazing treatments were applied using sheep from September 1976 to March 1978 (grazing at 14-day intervals to 3 and 8 cm, respectively), after which plots were split and four grazing pressures applied for the summer period. These were very hard (to 2 cm every 10 to 14 days), grazed at 8 cm to 3 cm, grazed at 14 cm to 3 cm, and very lax (to 5 cm every 6 to 8 weeks). All treatments received similar management in the subsequent autumn, winter and spring (grazed to 3 cm every 4 weeks), with the four grazing pressures applied again in the second summer. Botanical composition of pasture was determined from herbage cuts to grazing height within exclosure cages at each grazing.

RESULTS

EXPERIMENT 1 (Table 1)

Of the 10 grazing treatments, 6 resulted in major changes in the ryegrass, paspalum, or white clover compositions. Individual treatment effects over the two summers relative to the control were as follows:

TABLE 1: EXPERIMENT 1 — THE EFFECT OF SEASONAL GRAZING MANAGEMENT ON THE BOTANICAL COMPOSITION OF RYGRASS/PASPALUM PASTURE IN SUMMER IN THE WAIKATO

Treatments	*Paspalum (%)*		*Ryegrass (%)*		*W/Clover (%)*	
	Feb. 1978	*Feb. 1979*	*Feb. 1978*	*Feb. 1979*	*Feb. 1978*	*Feb. 1979*
Control (grazed to 3-4 cm)	13cd*	27bcd	66a	53a	12bc	8b
Hard grazing —						
Early spring	23bc	41ab	52abc	43abc	15abc	8b
Winter	24bc	31abc	52abc	49ab	15abc	9ab
Winter followed by silage cut in spring	13cd	20cd	57ab	54a	22a	16a
Winter followed by hay cut in spring	9d	18d	60a	47abc	19ab	10ab
Whole summer	44a	43ab	42c	32bc	11bc	7b
Early summer only	39a	45a	45bc	34c	9c	6b

*Duncan's Multiple Range Test: Values within each column without a common letter differ significantly ($P < 0.05$).

Hard grazing in early spring reduced the proportion of ryegrass and increased the proportion of paspalum in the following summer.

Hard winter grazing followed by silage and hay cuts reduced the proportion of paspalum in the following summer. The effect was relatively greater with the hay cut. Both silage and hay cuts increased the proportion of white clover.

Hard summer grazing reduced the proportion of ryegrass, and increased paspalum. The effect on ryegrass was greater in the second summer, when soil moisture levels were higher. The effects on paspalum carried over from one summer to the next, as shown by percentage paspalum increase at the start of the second summer period.

EXPERIMENT 2 (Table 2)

Lax grazing resulted in pastures with similar paspalum contents to those hard-grazed from early spring to midsummer. There appeared to be a marked relative increase in paspalum from one summer to the next, especially in pastures grazed laxly for the whole of the year in 1978-g. The general increase in paspalum content of summer pastures in 1978-9 was thought to be due to the more favourable environmental conditions in that year for paspalum growth.

Hard grazing from late spring to early autumn reduced the paspalum in the immediately following summer period, and in-

TABLE 2: EXPERIMENT 2 — THE EFFECT OF SEASONAL GRAZING MANAGEMENT ON THE BOTANICAL COMPOSITION OF RYEGRASS/PASPALUM IN SUMMER IN THE WAIKATO

Treatments	*Paspalum (%)*		*Ryegrass (%)*		*W/Clover (%)*	
	1977-8	*1978-9*	*1977-8*	*1978-9*	*1977-8*	*1978-9*
1. Lax grazing	37	68	56	26	3	3
2. High grazing pressure late spring to mid-summer	28	59	64	21	5	16
3. High grazing pressure early spring to early summer	41	60	46	29	3	7
4. High grazing pressure late spring to autumn	24	46	72	35	2	14
SE. of Diff. (±)	10	10	15	9	5	15
Sign.	< 0.05	< 0.05	< 0.05	< 0.05	n.s.	n.s.

creased the ryegrass component of pastures. The effect was consistent in both summers, although by the following spring the treatment pastures were again similar to each other in botanical composition.

The timing of hard grazing in the spring had a significant effect on paspalum content of pastures in 1977-8. Pastures hard-grazed in mid-August compared to mid-October had 13% more paspalum and 18% less ryegrass in the summer of 1977-8. The spring temperatures in 1977-8 were well below normal for the district and the effect of the early hard-grazing treatment did not occur in 1978-9, when spring temperatures were closer to normal.

EXPERIMENT 3 (Table 3)

Lax grazing in spring 1976 reduced paspalum content of pasture in the immediately following summer period, with an opposite but less marked effect on ryegrass content. There was a carryover effect of the spring grazing management from one summer to the next. In summer 1976-7 there were no effects of the summer grazing management on the paspalum component, although ryegrass was suppressed by very lax grazing. However, by the second summer very lax grazing led to a very large increase in the proportion of paspalum, and this effect was more marked in plots hard-grazed in the spring of the previous year. In summer 1977-8, ryegrass content was again lower in plots very laxly grazed.

TABLE 3: EXPERIMENT 3 — THE EFFECT OF GRAZING MANAGEMENT DURING SPRING AND SUMMER ON THE BOTANICAL COMPOSITION OF RYEGRASS/PASPALUM PASTURES IN NORTHLAND

Treatments	*Summer 1976-7*			*Summer 1977-8*		
	Paspalum	*Ryegrass*	*White Clover*	*Paspalum*	*Ryegrass*	*White Clover*
Spring management:						
Hard grazed	14.7a*	49.6a	18.2a	25.1a	36.8a	17.2a
Laxly grazed	3.8b*	58.1b	16.3a	11.6b	53.1b	18.9a
Summer management:						
Very hard grazed	9.1a	56.2a	14.9a	11.6a	48.9a	21.8a
From 8 to 3cm	7.4a	59.5a	13.2a	13.1a	49.7a	17.2a
From 14 to 3 cm	9.1a	57.6a	15.5a	17.4a	47.1a	15.5a
Very laxly grazed	11.3a	42.0b	25.2b	31.3b	34.4b	18.0a

Note: Individual species expressed as a percentage of the dry matter yield of the green components (Total DM – dead material DM); significance lettering refers to Newman-Keuls test at 5% significance level.

DISCUSSION

In these experiments large differences in botanical composition resulted from the intensity of pasture defoliation applied in spring or summer, but there was little effect of winter grazing. Hard grazing in spring generally resulted in a higher proportion of paspalum the following summer, with an associated decrease in the ryegrass component. The effect of less intense spring grazing was such that not only was paspalum content substantially reduced within one season, but this effect was carried over from one season to the next, Pastures, however, which were laxly grazed throughout the whole year did not show a significant reduction in paspalum content, an effect which suggests that managements favouring paspalum in summer can rapidly correct the decline occurring as a result of lax spring grazing.

The ideal time for hard grazing of spring pastures to encourage paspalum should coincide with temperatures favourable to the initiation of paspalum growth (Mitchell, 1956). As winter and spring temperatures are lower in the Waikato than in Northland, the critical period for hard grazing required to alter the grass balance will be somewhat later in the spring season (on average, towards the end of October in the Waikato and September in Northland).

The effects of hard summer grazing on the grass balance of swards appeared to differ with sheep and cattle. Paspalum increased with cattle, an effect associated with a reduction in the ryegrass component probably largely through pulling. These findings are in accordance with a survey that noted greater abundance of paspalum on beef and dairy cattle farms compared with sheep farms (Percival, 1977). Lax sheep grazing in summer increased paspalum content, which is also in agreement with the observations of Allo (1953), Arnold (1953) and Bell (1954). The apparent decline of paspalum in Northland and Bay of Plenty pastures in recent years (Percival, 1977) is widely thought to be be due to excessive hard. grazing over a series of dry summers. Our results do not support such a view, and in fact confirm the contention of Hunt (1,979) that the species is relatively tolerant to heavy summer treading, especially when grazed by cattle. The decline in the paspalum content of pastures is thought to be more likely due to the adoption of pasture management practices in the spring, such as slower rotations and increased areas of conservation in the form of hay and silage, which leads to a dominance of the ryegrass component. Harris and Lazenby (1974) reported that, when considered overall, paspalum was less aggressive than other grasses such as ryegrass, tall fescue and phalaris, though

the aggressiveness of paspalum varied between seasons. The finding of the present studies that the paspalum/ryegrass mixture is very sensitive to grazing pressure shows that the management regime is relatively more important in the expression of either component than their inherent aggressiveness.

The main value of the paspalum component in pastures appears to lie in its summer producing ability (Lambert, 1967), although pastures consisting almost exclusively of paspalum result in low winter and spring production. Thus the grazing management of paspalum/ryegrass pastures must be refined to allow maximum expression of each component if a high producing steady-state pasture is to be sustained. The experiments reported in this paper should provide guidelines to farmers who wish to manipulate the balance of their reygrass/paspalum pastures to the best advantage.

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