The effect on incidence of bloat of changing pasture herbage mass and species

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ABSTRACT

The effects on bloat of herbage mass and of removing *Poa* from pasture was investigated. Twelve paddocks were paired on pasture composition in autumn and *Poa* seedlings were removed from one paddock in each pair. Each paddock was halved and two levels of herbage mass were established. The resulting treatments, high herbage mass with *Poa* (H+P), high mass without *Poa* (H-P), low mass with *Poa* (L+P), and low mass without *Poa* (L-P), were grazed by four groups of six cows of high susceptibility to bloat over four 12-day periods in spring. Herbage mass was 814 kg DM higher ($P<0.001$) before grazing and 518 kg DM/ha higher ($P<0.001$) after grazing on H versus L. *Poa* content (% DM) was higher and white clover lower in +P compared to -P (*Poa* 11 and 2%, $P<0.001$; clover 16 and 26%, $P<0.001$). The average bloat score was highest on L-P and least on H+P and was 2.4 times greater on L than H and 5.5 times greater on -P than +P. Results indicated that bloat could be manipulated by altering herbage mass, but any effect on bloat of *Poa* was confounded with changes in white clover content.

Keywords: dairy cows; bloat; *Poa*: herbage mass; pasture; grazing; white clover.

INTRODUCTION

The incidence of bloat is sporadic both within and among farms. In a paired farm study involving 16 farms with bloat and 16 farms without bloat (Carruthers & Henderson, 1994), bloat-free farms had pastures with less ryegrass and more grasses other than ryegrass present, and grazed pastures to leave a higher residual herbage mass than did bloat-prone farms during the late winter-spring period. A longer grazing interval over winter on bloat-free farms possibly contributed to their higher pasture mass. *Poa* and cocksfoot were predominant in the grasses other than ryegrass component. A grazing trial was established to investigate effects on bloat of altering herbage mass and grass species.

MATERIALS AND METHODS

Six pairs of adjacent 0.25 ha paddocks with similar white clover and ryegrass contents, based on botanical dissection of herbage samples, were selected in autumn 1992, and one paddock per pair was sprayed with Kerb® Flo (Rohm and Haas NZ Ltd) at 1 l/ha, to kill germinating *Poa* seedlings. Each paddock was subdivided and the time of grazing on each half varied so that by September half of each paddock was 50-60 days since the previous grazing and the other half 100-105 days since the previous grazing. The objective was to achieve a difference of at least 500 kg dry matter (DM)/ha higher on one half than on the other, resulting in four treatments (each 0.125 ha) within each pair of paddocks: high herbage mass with *Poa* (H+P), high mass without *Poa* (H-P), low mass with *Poa* (L+P) and low mass without *Poa* (L-P).

Treatment areas were grazed during four 12-day periods from September to November using four groups of six Friesian-Jersey crossbred cows of high susceptibility to bloat (Morris *et al.*, 1991) and aged from 2 to 13 years. Each pair of paddocks was grazed over two days in each period using two 24 h grazings. Cows were offered fresh pasture after each morning milking. Cows were lactating except that two which had not calved at the start of the trial subsequently calved in Period 1. Cows were milked daily at 0700 and 1500h and were drenched with $MgCl_2$ and bloat preventative at each afternoon milking and with 7 mls pluronic based bloat preventative at both milkings on days when there was no bloat scoring. Previous experience indicated this would not carry over to affect bloat the following morning. The order of treatments grazed was such that the groups of cows changed *Poa* level within herbage mass between Periods 1 and 2; in Period 3 the groups changed levels of both herbage mass and *Poa* compared to Period 2. Extra cows were added to H+P and H-P areas overnight when necessary so that the difference between the H and L areas after grazing was not more than 500 kg DM/ha.

Cows were observed for bloat at the morning grazing on 9-11 days per 12 day period. Observation involved watching the cows throughout the grazing period until afternoon milking. Bloat scores were based on visual assessment of distension and palpation of the flanks using 0=no bloat; 1=mild bloat; 2=moderate bloat; 3=severe bloat. Cows were drenched with paraffin on reaching Score 2. Pre- and post-grazing herbage masses were estimated daily on each treatment area using the Ellinbank Rising Plate meter. Species and chemical composition were determined every two days on pasture clipped to 2 cm from each treatment area on the pair of paddocks about to be grazed. Data were analysed as a Latin Square using Genstat. Bloat was analysed as the average total daily bloat score per treatment group (the total daily score being the sum of scores for the six cows at the scoring each day). This reflected both the number of cows bloating and severity of bloat except that severity was affected by the drenching policy.

RESULTS

Pre- and post-grazing herbage masses were similar on L-P and L+P and on H-P and H+P (Table 1). The difference in herbage mass on H compared to L averaged 814 kgDM/ha

(SED 122, P<0.001) before grazing and 518 kg DM/ha (SED 23, P<0.001) after grazing. Pre-grazing herbage mass did not differ between grazing periods, averaging 2714, 2816, 3077 and 2888 kg DM/ha in Periods 1, 2, 3 and 4, respectively, (SED172, P>0.1). Post-grazing herbage mass was least in Period 1 compared to the other periods (1558, 1833, 2149 and 1984 kg DM/ha in Periods 1, 2, 3 and 4, respectively, SED 32, P<0.001).

Poa species averaged 2 and 11% of DM on -P and +P areas, respectively, (SED 0.8, P<0.001), and white clover content was increased in -P areas by an amount similar to the decrease in *Poa* (26 and 16% white clover on -P and +P, respectively, SED 1.8, P<0.001). The content of white clover was also lower (P<0.01) in H compared to L herbage mass, although this effect was greater for -P than for +P areas. Ryegrass content was slightly lower in L than H (62 versus 68% DM, SED 2.4, P<0.1), but *Poa* content was not affected by herbage mass. Ryegrass, white clover and *Poa* contents did not differ among grazing periods.

The average total daily bloat score per treatment group was highest on L-P and least on H+P (Table 1). Bloated cows were drenched therefore the scores reflect the number of cows with bloat rather than its severity. The number of cows with bloat at each scoring averaged 3.1, 1.4, 0.6 and 0.2 cows for L-P, H-P, L+P and H+P, respectively. The average daily bloat score was higher in Periods 2 and 3 than in Periods 1 and 4 (1.47, 1.97, 2.21, 0.85 for Periods 1, 2, 3 and 4, respectively, SED 0.40, P<0.1). When averaged over both *Poa* treatments or both herbage masses, total bloat score was 2.4 times greater on L than H and 5.5 times greater on -P than +P.

White clover and *Poa* contents of pastures were negatively associated (Figure 1A). Bloat score was positively associated with white clover content (Figure 1B) or negatively with *Poa* content. The association between white clover (WCC, % DM) and bloat score was:

Bloat score = -4.39 (±0.97) + 0.36 WCC (±0.04), R^2=0.75.

In vitro organic matter digestibility and nitrogen content were lower (P<0.001) and acid detergent fibre and water soluble carbohydrate contents were higher (P<0.001, P<0.05) in H than in L (Table 2). Nitrogen content was lower (P<0.001) and fibre and carbohydrate contents higher (P<0.05, P<0.001) in +P than -P. From Periods 1 to 4, *in vitro* digestibility decreased (87.0 to 78.8, SED 1.4), fibre content increased (21.6 to 25.6, SED 0.6) and water soluble carbohydrate decreased (18.7 to 13.6, SED 1.1).

TABLE 1: Content in pasture (% DM) of ryegrass (RG), white clover (WC), *Poa* species, other grasses (OG), weeds and dead material, pre and post-graze herbage masses (kg DM/ha) and the average total daily bloat score per treatment group on pastures with (+P) or without (-P) *Poa* grazed at low (L) and high (H) herbage mass.

	Treatment					Significance tests		
	L-P	H-P	L+P	H+P	SED	Mass	*Poa*	MxP
RG	60	67	65	68	3.4	+	NS	NS
WC	32	21	19	14	2.5	**	***	NS
Poa	2	3	10	11	.1	NS	***	NS
OG	1	3	2	1	1.5	NS	NS	NS
Weed	4	3	3	2	0.9	NS	NS	NS
Dead	1	3	2	3	0.6	*	NS	NS
Pre-graze	2497	3288	2436	3275	172	***	NS	NS
Post-graze	1640	2133	1604	2147	2	***	NS	NS
Bloat score	3.9	1.6	0.7	0.3	0.4	**	***	*

FIGURE 1: Associations between white clover and Poa contents (% DM) and between white clover content and daily total bloat score per treatment group in high herbage mass with *Poa* (H+P), high mass without *Poa* (H-P), low mass with *Poa* (L+P) and low mass without *Poa* (L-P) treatments plotted for each pair of paddocks averaged over 4 grazing periods (4 treatments x 6 pairs).

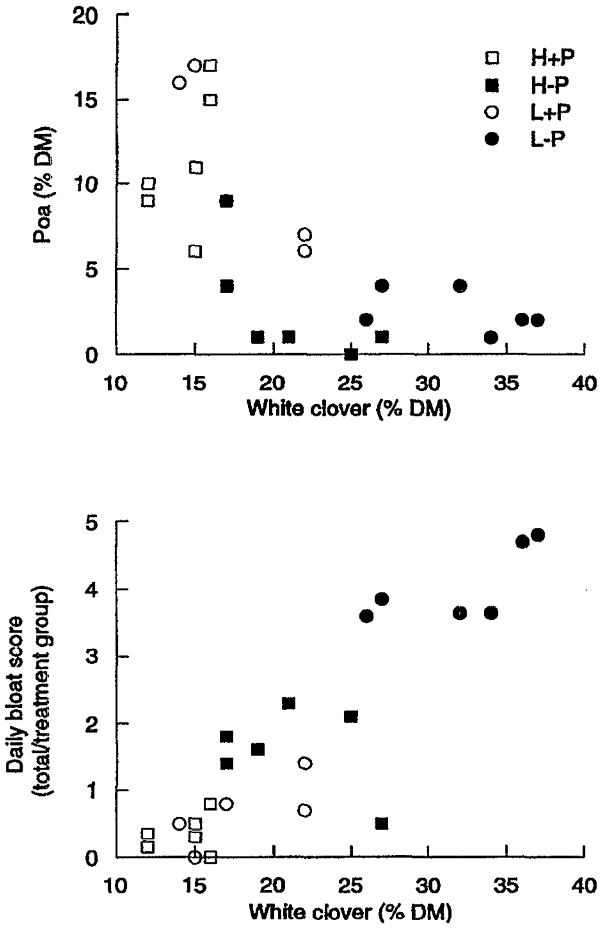

TABLE 2: In vitro organic matter digestibility (%) and contents (% DM) of nitrogen, acid detergent fibre and water soluble carbohydrate (WSC) in pastures with (+P) or without (-P) *Poa* grazed at low (L) and high (H) herbage mass.

	Treatment					Significance tests		
	L-P	H-P	L+P	H+P	SED	Mass	*Poa*	MxP
Digestibility	84.1	83.0	84.1	82.7	0.41	***	NS	NS
Nitrogen	3.88	3.66	3.41	3.14	0.07	***	***	NS
Fibre	22.6	23.3	23.3	24.2	0.3	***	*	NS
WSC	13.5	14.5	16.1	17.4	0.6	*	***	NS

DISCUSSION

The incidence of bloat was significantly reduced by increasing the herbage mass before and after grazing. Bloat incidence was more than halved by accumulating 800 kg DM/ha higher pasture mass before grazing and leaving 500 kg higher mass after grazing, whilst maintaining the grazing interval during the period of the trial. As both pre- and post-grazing herbage masses differed between the H and L mass areas, the relative importance of either in its effect on bloat was not determined.

The increase in herbage mass was associated with a decrease in clover content, possibly due to competition arising from the longer grazing interval (Hay & Hunt 1989) used to establish the higher mass at the start of the trial. H mass herbage was also of lower digestibility and nitrogen content, and of higher fibre content. The compositional differences observed were consistent with leaving a greater proportion of stem material in the higher post-grazing masses. The reduced bloat incidence likely reflected some or all of these changes, as did the decline in bloat from Period 1 to 4. Grazing intervals were the same for all treatments so differences in species, composition and bloat did not arise from differences in regrowth interval. *Poa* was not apparently affected by herbage mass to the same extent as clover, as *Poa* content was similar in high and low mass areas. Differences between farms in post-grazing herbage mass were observed without differences in clover content in the paired farm study of Carruthers & Henderson (1994), possibly because the 113-159 kg DM/ha difference in mass observed over two years was about one quarter of that in the present study. The *Poa* contents ranged from 6 to 17% in +P paddocks in the present study and were lower than values observed in the paired farm study where paddocks on individual farms ranged up to 40% of DM.

The effect on bloat of the *Poa* content of pasture was inconclusive. *Poa* and white clover contents were confounded and there was insufficient variation in paddock species contents to adequately separate individual effects on bloat. Bloat is commonly associated with legumes although at low pasture clover contents other factors may determine bloat incidence (Carruthers & Henderson 1994). The extent to which either the spray affected ryegrass vigour or the removal of *Poa* seedlings contributed to the increase in white clover content in sprayed paddocks was not determined. Ryegrass and white clover contents were similar within pairs of paddocks before spraying, but at the next sampling (33 days after spraying) the ryegrass content had decreased and white clover content increased in sprayed relative to unsprayed paddocks, and these differences remained. Options for experimentally manipulating *Poa* content without affecting other sward species are limited.

Although uncertainty remains as to whether strategic use of paddocks varying in grass species, as suggested by Carruthers & Henderson (1994), would effectively reduce bloat, the demonstrated effect on bloat of increasing herbage mass offers farmers an option for reducing bloat through manipulation of grazing management.

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