Peer-reviewed paper: Proc. 41st Congress of the South African Society for Animal Science

Effect of different grazing pressures by lambs grazing *Lolium perenne* and *Dactylis glomerata* pastures during spring on: 2. Intake and growth

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Abstract

This study was undertaken to determine the influence of three grazing pressures [high (HGP), medium (MGP) and low (LGP), corresponding to 30, 50 and 75 g available DM/kg BW/day, respectively] on the performance of lambs grazing *Lolium perenne* and *Dactylis glomerata* pastures in spring. Feed intakes and average daily live weight gains (ADG in g/day) were determined for each group. In general intakes of both *L. perenne* and *D. glomerata* pastures were higher at the end of the study than at the onset. Grazing pressure had no effect on the intake of *L. perenne*, but on the *D. glomerata* pasture, HGP resulted in a decreased intake by the lambs compared to the LGP treatment. For both pasture species the ADG of the lambs were lower on the HGP compared to the MGP treatment, though intake and ADG of the lambs were higher when grazing *L. perenne* compared to *D. glomerata*.

Keywords: Cocksfoot, diet selection, pasture availability, perennial rye grass, performance
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Introduction

Animal productivity and efficiency of production are functions of the level of nutrition, which in turn is dependent on the animal's requirements, nutrient content of the feeds, digestibility of the feed and voluntary feed consumption (Allison, 1985). Since the concentration of nutrients can vary considerably among the different parts of a plant, choice of parts can markedly affect a herbivore's nutrient intake (Dove *et al.*, 1999), the amount and proportion of nutrients absorbed and the nutritional status and production performance of farm animals (Pearson & Ison, 1997; Mayes & Dove, 2000). Grazing management affects intake and animal performance through its direct and indirect effect on the number of animals on the pasture, canopy structure and the quantity and quality of forage on offer (Pearson & Ison, 1997). Stocking rate in particular has an immediate effect on forage availability and selectivity by grazing animals, thereby affecting intake and animal performance (Tainton, 1999). At high stocking rates intake is depressed because of limited pasture availability (Jones *et al*., 1987), and the opportunity of selection and digestibility may also decline. At high levels of pasture availability, intake is relatively constant and it is depressed if the dry matter (DM) availability dropped below a certain level (Allden & Whittaker, 1970). The objective of this study was to determine the influence of pasture availability or grazing pressure on intake and growth performance of lambs grazing two irrigated pasture species during spring.

Materials and Methods

The study was conducted at the Hatfield Experimental Farm of the University of Pretoria. Details of the experimental site, soil profile and fertilization programme have been reported by Van Niekerk *et al*. (2006). The two perennial pasture species, *Lolium perenne* cv. Nui and *Dactylis glomerata* cv. Hera, were planted at the end of April for subsequent grazing during spring of the next year. Each pasture species was divided into 0.5 ha paddocks that could be subjected to different grazing pressures as per treatment allocation. The pastures received a minimum of 25 mm water per week (irrigation and/or rainfall).

Three levels of pasture availability, 30, 50 and 75 g available DM/kg BW/day that correspond to grazing pressures of 50 (HGP), 30 (MGP) and 20 (LGP) kg BW/kg DM/day, respectively, were evaluated using South African Mutton Merino wether lambs (initial weight, 30 ± 0.2 kg). A total of 50 test lambs per treatment group were used in additional to the 4 oesophageal fistulated lambs that were used per treatment to collect samples of ingested vegetation at the onset (initial) and end (terminal) of the grazing period. Pasture intake was estimated from the ratio of faeces organic matter (OM) in collection bags (Langlands, 1975) and the indigestibility of these samples by converting the *in vitro* digestibility to *in vivo* digestibility, according to

Engels *et al*. (1981). Live weights of the lambs were measured weekly without withholding water and feed. The organic matter intake (OMI in g/head/day), digestible organic matter intake (DOMI in g/head/day), the digestible organic matter intake per kg metabolic body weight (DOMI in g/$W^{0.75}$/day) and average daily live weight gain (ADG in g/day) were determined for each treatment group.

All parameters measured in the experiments were analyzed using the Proc GLM of SAS (2001). Where F ratio has shown significance, differences between the means were tested using the Bonferroni's test (Samuels, 1989).

Results and Discussion

Dry matter intake at the end of the grazing period was higher than at the onset of the trial (Table 1). Generally a higher level of pasture intake could be the consequence of a higher rate of digestion and/or a higher rate of passage of the ingesta through the digestive tract of the animal (Van Soest, 1994). However, in this investigation the quality of the diet consumed by the lambs at the end of the study period was lower (i.e. lower N, higher ADF and lower IVDOM) than at the initial stage, mainly due to changes in pasture availability and loss of green leaves due to senescence (Van Niekerk *et al*., 2006). Therefore this higher pasture intake at the end of the trial was at variance with the observed decline in quality of the diet selected at this stage (Van Niekerk *et al.*, 2006). A combination of other factors such as physical characteristics of plant cells and how they developed, their age and response to their environment, sward structure, grazing pattern and increase in body weight of lambs (Pearson & Ison, 1997) might have contributed in maximizing feed intake. In particular changes in sward structure (height, leafiness, density and distribution) affect intake due to their effect on the rate of intake and selective grazing (Allden & Whittaker, 1970; Chacon *et al*. 1978). Forbes & Hodgson (1985) pointed out that as grazing time increases and the amount of feed decreases, there is a decline in DM intake per bite and a tendency to increase the time spent grazing. However, there is a limit to what extent animals can compensate for reduced intakes per bite (Hodgson & Illius, 1996).

Table 1 Mean digestible organic matter intake at the start (initial) and end (terminal) of each grazing period for lambs grazing *Lolium perenne* and *Dactylis glomerata*

Pasture species	Sampling stage	Intake	
		DOMI (g/head/d)	DOMI (g/kg $W^{0.75}$/d)
Lolium perenne	Initial	507[b]	41.7[b]
	Terminal	798[a]	50.7[a]
	s.e.	29.7	2.0
Dactylis glomerata	Initial	380[b]	30.5[b]
	Terminal	581[a]	37.1[a]
	s.e.	11.2	0.8

For each pasture species, column means followed by different superscripts differ at $P < 0.05$

It is well documented that animal intake increases asymptotically with a decrease in grazing pressure or with increased herbage availability (Le Du *et al.*, 1979) because of increased diet selection (Hodgson & Illius, 1996). Effects of grazing pressure on intake are mediated largely through changes in the digestibility of the diet, which in turn is a function of the negative association between degree of digestion and rate of passage of digesta (Van Soest, 1994). In this study, grazing pressure had no effect on intake of *L. perenne*, though there seems to be a declining trend in intake with an increase in grazing pressure (Table 2). However, on the *D. glomerata* pasture DOMI (g/head/day) of the lambs was lower when on the HGP treatment compared to the LGP treatment. A high grazing pressure stimulates higher tiller density than a lenient grazing pressure (Grant *et al*., 1981; Hodgson & Illius, 1996). However, the quality of grazed diets decreases under HGP only when the intensity of defoliation is enough to limit availability of herbages, thereby reducing the opportunity for selective grazing (McKenzie, 1997; Van Niekerk *et al*., 2006). Ultimately the coarser, more mature portions of plants will be eaten, resulting in lower digestibility and nutrient content of the selected diet (Pearson & Ison, 1997). The higher intake of lambs under LGP can be attributed mainly to

greater diet selection (Van Niekerk *et al*., 2006) resulting in an increase in quality of feed consumed by the animal, which in turn permits more rapid selection and passage of the feed through the animal. For both pastures, HGP significantly reduced the ADG of the lambs compared to those under MGP, but the ADG of lambs under MGP was comparable to those under LGP. Hess *et al.* (2002) noted that animal performance is a function of digestible nutrient intake. The latter in turn is influenced by selectivity of the animals. However, the extent of selection is associated significantly to the influence of grazing management on canopy structure (Hodgson, 1982).

Table 2 Mean digestible organic matter intake and average daily live weight gain (ADG) of lambs grazing *Lolium perenne* and *Dactylis glomerata* at different grazing pressures

Pasture species	Feed availability (g DM/kg BW/d)	Grazing pressure	Intake		ADG (g/head/d)
			DOMI (g/head/d)	DOMI (g/kg $W^{0.75}$/d)	
Lolium perenne	75	LGP*	843	52.3	216[ab]
	50	MGP	791	48.9	238[a]
	30	HGP	761	52.3	188[b]
	s.e.	-	38.6	1.8	9.6
Dactylis glomerata	75	LGP	623[a]	39.7	205[a]
	50	MGP	583[ab]	35.4	213[a]
	30	HGP	538[b]	36.2	145[b]
	s.e.	-	19.7	1.4	14.5

For each pasture species, column means followed by different superscripts differ at $P < 0.05$
* LGP: low grazing pressure; MGP: medium grazing pressure; HGP: high grazing pressure

Table 3 Influence of pasture species on intake and growth performance of lambs

Parameter	Pasture species		s.e.
	Lolium perenne	*Dactylis glomerata*	
Intake			
DOMI (g/head/d)	798[a]	581[b]	21.5
DOMI (g/kg $W^{0.75}$/d)	50.7[a]	37.1[b]	1.1
Performance			
ADG (g/head/d)	214[a]	187[b]	8.4

Means within a row followed by different superscripts differ at $P < 0.05$

In the present study intake and growth rate of lambs differed significantly between pasture species. The DOMI (g/head/day), DOMI (g/kg $W^{0.75}$/day) and ADG (g/head/day) of the lambs were higher for lambs on *L. perenne* than those on the *D. glomerata* pasture (Table 3). All other things being equal, intake of sheep is at its highest when pastures are tall, leafy and dense relative to the animal's bite characteristics (Hodgson & Illius, 1996). The lower NDF concentration of grass selected by the lambs on *L. perenne* corresponded well with their higher intake and growth rates compared to the lambs grazing the *D. glomerata* pasture (Van Niekerk *et al*., 2006). Noteworthy, the ADG recorded for lambs on *L. perenne* (214 g/head/d) during spring was higher than all ADG values reported for lambs grazing a *P. maximum* (80-140 g/head/d) pasture at different stocking rates (Relling *et al*., 2001).

Conclusions

Although the current data are from a one season experiment, it is evident that a moderate grazing pressure maximized both the intake and growth rate of lambs compared to a high grazing pressure. On average, higher levels of animal performance were recorded in lambs grazing *L. perenne* than those grazing *D. glomerata*. The former could be used successfully to finish off lambs in higher rainfall areas or under irrigation during spring.

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