The Effect of Sward Surface Height on Sheep Grazing Activities

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THE EFFECT OF SWARD SURFACE HEIGHT ON SHEEP GRAZING ACTIVITIES

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Abstract

The objective of this study was to assess the effect of Italian ryegrass (*Lolium multiflorum* Lam.) sward height on grazing activities. The experiment was carried out at the Research Station of Universidade Federal do Rio Grande do Sul, Brazil. Yearling no-castrated male lambs behavior was assessed in terms of diurnal grazing, ruminating and idling time in three periods: 27 September 11 and 25 October. Sward surface height was monitored using a sward stick and samples of 0.25 m^2 were cut to ground level to estimate herbage and leaf lamina mass. The experiment was carried out in a randomised block design with three replications of four treatments: sward surface heights (5, 10, 15 and 20 cm). Grazing time and ruminating time were somewhat interchangeable, decreasing grazing time and increasing ruminating time with increasing sward surface heights. Idling time remained relatively constant. Sward height showed a small effect on biting rate.

Keywords: Italian ryegrass, *Lolium multiflorum* Lam., grazing time, ruminating time, idling time.

Introduction

Several studies (e.g. Penning, 1986) demonstrate that ingestive behavior, live weight gain, wool production and ovulation rate are affected by forage allowance and sward height. Sward height is one of the most important pasture characteristics that affect intake of grazing animals. As sward height decrease, there is a direct influence on grazing time, number of bites and bite mass (Hodgson, 1981), the three major constituents of daily intake on pastures. Recently, it had been an agreement that variables concerning intake at lager temporal scales, particularly grazing time, need to be more studied. The objective of this study was to assess the effect of Italian ryegrass sward height on grazing, ruminating and idling time, and biting rate.

Material and Methods

The experiment was carried out at the Experimental Station of Universidade Federal do Rio Grande do Sul, Brazil (30º 05'22''S and 51º39'08''W). Eleven yearling not castrated lambs (testers) of approximately 35 kg of livewheight grazed an Italian ryegrass (*Lolium multiflorum* Lam.) sward on a continuous variable stocking. Put-and-take animals were used to regulate the sward surface height (SSH). The experiment was carried out in a randomised block design with three replications of four treatments: 5, 10, 15 and 20 cm of SSH. The sward surface height (SSH) was randomly measured using a sward stick (Barthram, 1986). One hundred readings in each plot were taken in the following day of the grazing behavior assessment. Herbage mass was estimated by cutting five 0.25 m^2 quadrats to ground level with shearing scissors in each plot in the same day of the SSH measurements. After cutting, the samples were dissected into categories for morphology (leaf lamina, sheath, stem, and dead tissue) and species. The samples, then, were dried in a draught oven at 65^oC and weighed individually. The distribution of individual animal activity (grazing, ruminating and resting) was recorded from dawn to dusk of three randomly

chosen animals/plot, at intervals of 10 minutes, using the method of Jamieson and Hodgson (1979). Rates of biting were also measured using the 20 bite method of Forbes and Hodgson (1985). The grazing behaviour assessment was carried out in three different periods 27 September, 11 and 25 October 1999. Statistical analysis were conducted using generalised linear model procedure (GLM) and regression procedure (REG) of the statistical analysis system (SAS, 1990).

Results and Discussion

There were significant difference in herbage mass, height and leaf lamina mass between treatments (Table 1). There was no significant difference in bulk density among treatments. As expected, taller swards had greater herbage and leaf lamina mass, however the difference between herbage and leaf lamina mass was also greater for the taller swards.

There was a significant effect of the treatments on the distribution of grazing activities (grazing, idling and ruminating time - Figure 1). As sward height decreased, the grazing time increased ($Y= 681.710 – 12.2622X$, $R^2 = 0.3530$, and $P = 0.0002$) and ruminating time decreased ($Y = 45.2182 + 8.8925X$, $R^2 = 0.3789$ and $P = 0.0001$) in linear pattern. It shows that as the sward surface height decreased the animals allocated more time grazing and less time ruminating. Idling time remained relatively constant ($Y = 86.6899 + 3.4970X$, $R^2 = 0.0532$ and $P = 0.1895$), regarding sward height as pointed out by Penning *et al*. (1991). The results confirm observations made by Penning (1986) with perennial ryegrass that sward availability has an important influence on distribution of grazing activities. As the sward become shorter the animals decrease the time spent grazing in order to compensate the reductions in intake. The effort required to detach plant material near the ground in short swards may have restricted bite depth, the major influence on variation in bite weight and intake (Laca *et al*., 1992). However the results also show

that with Italian ryegrass even in situations with high availability the animals still reduce the time spent grazing and increase the time spent ruminating as the sward height increase. There was no significant effect of the treatments on biting rate. (56.1 ±1.70, 52.44 ± 1.50, 56.9 ± 1.77 and 51.8 ± 2.05 bites/min, P-value=0.2391, for the treatments 5, 10, 15 and 20 cm, respectively). Although biting rate and grazing time are often regarded as the primary compensating responses of the animal to limitations in intake (Hodgson,1981), increases in grazing time were not followed by an increase in biting rate to maintain the intake rate. The variations in biting rate were certainly influenced by the sward structure. The low leaf density in treatments of greater height and the difficulties of prehensions (Barthram and Grant, 1994) in short swards could compensate the low variance found between treatments. In taller swards the pseudostems and stems may have acted as a deterrent to deep grazing penetration within the sward canopy (Dougherty *et al.*,1992). In this case, plant structure would be an important factor. It was observed a greater proportion of stems in the taller treatments. In conclusion, it can be seen that the sward structure of Italian ryegrass has and important influence on the ingestive behaviour. The sward height have a direct influence on the distribution of grazing activities, even at greater heights (above 15 cm), however biting rate seems to be more strongly influenced by the proportion of pseudostems and stems than sward height.

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Table 1 - Characteristics of Italian ryegrass sward according to the treatments (5, 10, 15 and 20 cm of sward height), averages of three periods 28 September, 12 and 26 October 1999, UFRGS-Eldorado do Sul, Brazil.

	Intended award surface height (cm)				
Sward characteristics	5	10	15	20	P-value[2]
Surface height (cm)	4.91	10.19	12.27	17.89	0.0001
SEM[1]	0.40	0.36	0.45	0.52	
Herbage mass (kg/ha)	918.8	2188.3	2287.6	3751.3	0.0001
SEM	112.59	100.01	124.64	145.14	
Leaf lamina (kg/ha)	230.7	533.1	604.4	715.0	0.0001
SEM	30.56	27.1	33.8	39.3	
Bulk density (mg/cm^3)	1.8	2.1	1.8	2.1	0.0527
SEM	0.1	0.09	0.12	0.14	

[1]SEM – Standard error of the means
[2]P-value of the treatment main effect

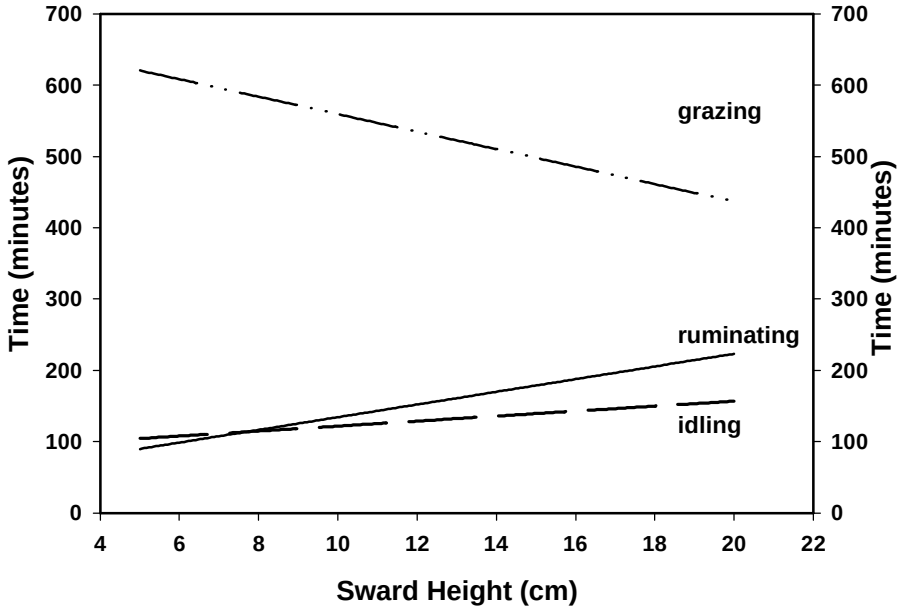

Figure 1 - Grazing behavior activities (grazing, ruminating and idling time) in relation to sward height.