Sheep Performance in Italian Ryegrass Swards at Contrasting Sward Heights

Paulo C. de F. Carvalho
Universidade Federal do Rio Grande do Sul, Brazil

L. S. Pontes
Universidade Federal do Rio Grande do Sul, Brazil

E. O. Silveira
Universidade Federal do Rio Grande do Sul, Brazil

C. H. E. C. Poli
Universidade Federal do Rio Grande do Sul, Brazil

Carlos Nabinger
Universidade Federal do Rio Grande do Sul, Brazil

See next page for additional authors

Presenter Information

Paulo C. de F. Carvalho, L. S. Pontes, E. O. Silveira, C. H. E. C. Poli, Carlos Nabinger, O. A. Pereira Neto, and G. E. Maraschin

ID # 22 - 33

SHEEP PERFORMANCE IN ITALIAN RYEGRASS SWARDS AT CONTRASTING SWARD HEIGHTS

P.C. de F. Carvalho[1], L.S. Pontes[1], E.O. Silveira[1], C.H.E.C.Poli[1],C. Nabinger[1], O.A. Pereira Neto, and G.E. Maraschin[1]

[1]D.P.F.A.,Agronomia – UFRGS, Porto Alegre, RS, Brasil.paulocfc@vortex.ufrgs.br

Abstract

The objective of this study was to assess the effect of Italian ryegrass (*Lolium multiflorum* Lam.) sward height on lamb performance. The experiment was carried out at the Research Station of UFRGS, Eldorado do Sul, Brazil. Yearling no-castrated male lambs were assessed in terms of individual animal performance and gain per hectare. The experiment was carried out in a randomised block design with three replications of four treatments: 5, 10, 15 and 20 cm of sward surface height (SSH), which were maintained using continuous variable stocking, and monitored by a sward stick. Samples of 0.25 m^2 were cut to ground level to estimate herbage and leaf lamina mass. Live weight gain per area and per animal increased in a quadratic pattern. The best animal production was found in a sward of approximately 15 cm high.

Keywords: lambs, animal performance, sward surface height, *Lolium multiflorum*, live weight gain

Introduction

Sward height determines both animal performance and pasture production by defining levels of animal intake (per animal and per hectare) and amount of leaf area available to intercept solar radiation. At sward heights lesser than 6 cm animal intake has been restricted in perennial ryegrass swards even if grazing time and bite rate are increased (Penning *et al*., 1991). Consequently, animal performance is strongly affected by sward height (Poppi *et al*., 1987). Even though a sward presents different structures regardless of maintaining the same height, it is important to determine the basic relationships between sward surface heights (SSH) and animal performance. The purpose of this study was to evaluate the potential of Italian ryegrass in terms of performance per animal and per unit area and to determine better sward heights as guidelines to optimise pasture utilisation.

Material and Methods

The experiment was carried out between August and November 1999 at Research Station-UFRGS, Brazil (30^{o} 05' 22'' S and 51^{o} 39' 08'' W). Italian ryegrass (*Lolium multiflorum* Lam) was sowed at 28/05 by direct drilling with 40 kg seeds/ha. The experimental design consisted of a randomised block design with three replications of four different SSH: 5, 10, 15 and 20 cm, monitored by a sward stick (Barthram, 1986), and controlled by continuous variable stocking. One hundred measurements per experimental unit of SSH were made once a week. Frequency of leaf, stem and inflorescence cover was monitored by registering the plant part that touched the sward stick. The animals were yearling no-castrated male lambs with 35 kg of liveweight. Individual animal performance was measured on eleven lambs per experimental unit weighted each 21 days interval. Animal gain per hectare was measured considering continuous variable

stocking. Herbage mass was measured each 21 days interval, cutting five samples per paddock to ground level. The samples were dried at 65^{o}C and separated in leaf lamina and stem+sheath components. Data were submitted to variance and regression, analyses using the statistical package SAS (1990).

Results and Discussion

Actual SSH was different from the target SSH, particularly in the short treatments (Table 1). This difference was mainly due to the difference of SSH in the beginning of the trial. SSH proposed was attained only three weeks after the beginning of the experimental period. Herbage mass were quite different between the extremes of SSH (treatments 5 and 20 cm), but there was only a small difference between treatments 10 and 15 cm (Table 1). As expected, greater herbage mass was observed at higher SSH. Leaf lamina mass was also greater with increasing SSH, being two fold greater for the 20 cm treatment comparing with 5 cm. The averages of individual LW gains were 113.2; 218.9; 221.2 and 235.7 g.day^{-1} and the LW gain.ha^{-1} were 240.4; 661.74; 479.7 and 460.79 kg for the treatments 5, 10, 15 and 20 cm, respectively (Table 1). Maintaining the sward at different heights by continuous stocking had a major effect on sward characteristics and on animal performance between treatments. Increasing SSH, both LW gain per area and LW gain per animal increased in a quadratic pattern. In short swards there was a low animal production due to the low herbage availability. On the other hand, in tall swards there was a reduced LW gain per area due to the reduced stocking rate. Figure 1 shows the relationship between SSH and animal performance. Regression analysis (Figure 1) showed significant effects for individual LW gain ($\hat{Y} = -517.363 + 98.8329X - 3.1922X^2$, $R^2 = 0.7279$, P. value = 0.0029) and LW gain. ha^{-1}

($\hat{Y}$ = -2155.61 + 395.310X – 14.0501X^2, R^2 = 0.5085, P. value = 0.0409). A quadratic model described that LW gain per animal increased until 15.48 cm of SSH (247.62 $g.day^{-1}$), and LW gain per area increased until 14.07 cm of SSH (624.97 $kg.ha^{-1}$). The animal performance (per animal and per area) declined in greater SSH probably due to changes in sward structure. The deterioration of sward structure on taller sward was also reported by Penning *et al*. (1991) and was particularly strong on Italian ryegrass due to its annual cycle. The best animal performance was found around 10 and 15 cm of SSH. This animal response is apparently related to sward structure. Although there was no significant difference among treatments in relation to the frequency of leaves observed in the sward surface (Table 1), there was a large difference among treatments in relation to the frequency of stem. The shortest swards had the greatest amount of stems and the tallest one the largest amount of seed heads. The lower quality of stem in relation to leaf reflected the lower animal performance in the shortest and tallest treatments. In conclusion, it can be seen that SSH around of 15 cm provides the best response in animal production. SSH of about 16cm would provide better condition to animal growth and SSH of 13cm gives better production per unit area.

References

Barthram, G.T. (1986) Experimental techniques: The HIFRO sward stick. Biennial Report 1984-1985, Hill Farming Research Organisation, Penicuik, pp. 29-30.

Penning P.D., Parsons A.J., Orr. R.J. and Treacher T.T. (1991). Intake and behaviour responses by sheep to changes in sward characteristics under continuous stocking. Grass and Forage Science, **46**:15-28.

Poppi, D. P., Hughes T.P and L'Huillier P. J. (1987). Intake of pasture by grazing ruminants. In: Nicol, A:M. (Ed.) Livestock feeding on pasture. 1987. pp. 55-63.

SAS (1990) SAS User's Guide. SAS Institute, Inc. Cary, NC.

Table 1 - Characteristics of Italian ryegrass sward, liveweight gain (kg/ha/day) and stocking rate (kg LW/ha) in different sward surface height treatments, UFRGS-Eldorado do Sul, Brazil.

	Treatments				
	5	10	15	20	P-value
Height (cm)	9.05	11.96	13.94	18.11	0.0006
SEM[1]	0.63	0.56	0.69	0.82	
Leaf lamina (Kg/ha)	594.59	729.45	770.65	865.47	0.0155
SEM	36.12	32.09	39.99	46.56	
Herbage mass (Kg/ha)	1416.5	2154.3	2103.8	3140.5	0.0009
SEM[1]	122.60	108.90	135.72	158.04	
Frequency leaf lamina touched by the sward stick (%)	92.63	100.00	98.52	96.57	0.0048
SEM[1]	0.92	0.82	1.02	1.19	
Frequency stem touched by the sward stick (%)	23.9	10.5	11.56	5.14	0.1274
SEM[1]	4.44	3.14	4.92	5.72	
Frequency seed head touched by the sward stick (%)	1.42	39.15	33.15	61.60	0.0141
SEM[1]	7.78	6.91	8.61	10.03	
Liveweight gain (kg/ha/day)	2.86	7.83	5.71	5.48	0.0574
SEM[1]	1.03	0.91	1.14	1.32	
Stocking rate (kg LW/ha)	2035	1534	1413	1033	0.0063
SEM[1]	109.90	97.63	121.66	141.68	

[1]SEM – Standard error of the means

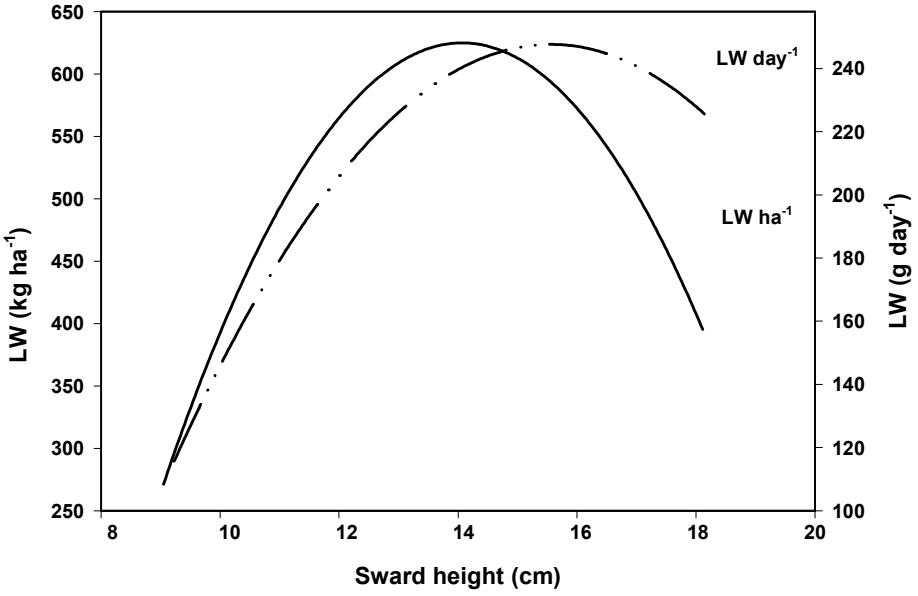

Figure 1 - Live weight gain (LW) per animal (g day $^{-1}$) and per hectare (kg) in relation to sward height.