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Fabio Montossi
INIA, Uruguay

G. Pigurina
INIA, Uruguay

E. J. Berretta
INIA, Uruguay

I. Santamarina
INIA, Uruguay

The XIX International Grassland Congress took place in São Pedro, São Paulo, Brazil from February 11 through February 21, 2001.
Proceedings published by Fundacao de Estudos Agrarios Luiz de Queiroz

ID # 08-19

A COMPARATIVE GRAZING STUDY OF SHEEP AND CATTLE DIET SELECTION ON NATIVE PASTURES IN URUGUAY

F. Montossi[1], G. Pigurina[1], E. J. Berretta[1], and I. Santamarina[1]

[1] Estación Experimental del Norte, Instituto Nacional de Investigación Agropecuaria (INIA), Ruta 5, km 386, Tacuarembó, Uruguay, fabio@inia.org.uy

Abstract

An experiment was carried out during winter, spring and summer 1997, on native pastures of the basaltic region of Uruguay to evaluate the effects of different herbage mass levels (high, medium and low) on sward characteristics and on sheep and cattle diet selection and grazing behaviour. Higher herbage masses resulted in increments in herbage accumulation and sheep bite weight: winter (1880, 1513 and 610 kg DM ha^{-1}, $P < 0.01$; 199, 148 and 128 mg DM/bite, $P < 0.01$), and summer (3046, 2175 and 1172 kg DM ha^{-1}, $P < 0.01$; 214, 175 and 143 mg DM/bite, $P < 0.01$) for high, medium and low herbage mass levels respectively. The nutritive value of diet selected by sheep and cattle was higher than that of the herbage on offer, and higher in sheep than in cattle: winter (10.2, 15.9 and 12.5% crude protein, CP, $P < 0.05$; 49.2, 32.4 and 38.1% acid detergent fiber, ADF, $P < 0.01$, and summer (7.4, 10 and 9.5% CP, $P < 0.05$; 51.1, 36.8 and 43% ADF, $P < 0.01$) for herbage on offer, sheep and cattle diets respectively. These contrasting results found in the nutritive value were closely associated with differences in the proportions of the botanical components recorded, particularly the differential contribution of dead material. This experiment quantified the importance of diet selection in determining the nutritive value of the forage eaten by sheep and cattle on the native pastures of the basaltic region of Uruguay and established some relationships between diet selection and grazing management, involving animal

selectivity ability differences (sheep versus cattle) and seasonal effects.

Keywords: native pastures, sheep, cattle, diet selection, grazing behaviour.

Introduction

Native pastures represent about 85% of the total land dedicated to sheep and cattle meat and wool production in Uruguay, where mixed (sheep and cattle) and continuous grazing are some of the main grazing practices applied by livestock farmers.

There are no research studies reported for the basaltic region of Uruguay, evaluating diet selection differences between sheep and cattle grazing native pastures under contrasting sward conditions as well as the impact of this phenomenon on the nutritive value of the forage selected by either sheep or cattle.

Material and Methods

During winter, spring and summer 1997, a diet selection study was carried out at "Glencoe" Research Unit (latitude 32^0 $01^{'}$ $32^{"}$ S, 57^0 $00^{'}$ $39^{"}$ W) of INIA-Tacuarembó Research Station, in an extensive region of basaltic soils in central-north Uruguay, South America.

Three experimental plots (6000, 8000 and 9000 m^2) of native pastures were used, located on medium to deep basaltic soils, divided by electric fences. The typical species composition, productive potential, nutritive value and seasonal patterns of growth of the native pastures utilised in the experimental area have been documented by Berretta (1998). Three herbage mass levels (high, medium and low) were created using different stocking rate intensities in these plots. Herbage mass (HM), botanical composition and sward surface height (SSH) were recorded in accordance with the procedures described by (Montossi et al., (1999).

Oesophageally fistulated animals (4 wethers and 4 steers) were used in accordance with

the experimental methodologies and procedures described by Montossi (1995).

Sward and diet selection data were analysed by the statistical package SAS (1990) based on a randomised complete design. Treatment means were compared by LSD test.

Results and Discussion

Sward data are presented for each season in Table 1. In general, the increase in herbage mass accumulation, achieved by grazing management, resulted in corresponding increments in HM and SSH values. The general tendency of higher sheep BWs recorded with increases in the levels of HM and SSH are in accordance with the results in the literature (Montossi, 1995). The association between sheep BW with HM or SSH were medium to high, being the relationships; BW (mgDM/bite) = 20 + 0.05 HM (kgDM/ha), R^2 = 0.74 and BW (mgDM/bite) = 35 + 13.3 SSH (cm), R^2 = 0.58, respectively. However, herbage mass accumulations did not necessarily result in better sward composition and structure, where, in general, the quantities and proportions of GHM and GLHM did not increase between medium to high herbage mass levels.

The botanical composition and nutritive value of the diet selected by oesophageally fistulated animals are shown in Table 2 for the three seasons studied. Leaf lamina and sheath were not distinguished, so results are compared in terms of green versus dead material, legume versus grass, and green leaf versus green stem. Green grass leaf made up more than 66% in the diets of both species, being this component quite similar between them, while the GGS component of the herbage on offer as well as in cattle diet were significantly higher than in sheep diet. Animal diets had higher proportions of GGL compared with herbage on offer (from 68 to 108 %). In contrast, TDC were significantly lower in sheep (77–85%) and cattle (58-75%) diets than in the herbage on offer, whereas sheep diets had significantly lower proportions of TDC than cattle diets (on average 21%). Weeds were minor components of the herbage on offer or extrusa samples, being this component preferred by sheep and not selected by cattle.

The presence of native legumes in herbage and extrusa samples was not significant. In general, the values of the parameters studied (CP, ADF and NDF) associated with the nutritive value of the herbage consumed by the fistulated animals were consistently higher than those obtained in the herbage on offer. These results also show the higher nutritive values of the extrusa samples taken by sheep in comparison with those of cattle. The lower and higher nutritive values of dead and weed components respectively and the increased lignification of stalky material, probably explained the differences found in the nutritive value among herbage on offer and sheep and cattle diets.

The information reported in this study is in accordance with the findings of several research studies carried out in temperate conditions with heterogeneous herbaceous communities, which generally found that sheep and cattle appear to select preferentially green material, leaves and legumes in comparison with dead material, stems and grasses, respectively (Montossi, 1995).

This trial establishes for the first time that diet selection plays an important role in influencing the nutritive value achieved by sheep and cattle in the native pastures of the basaltic region of Uruguay. It also gives some basis to explain, at least in part, the inconsistencies found when feed budgeting calculations are used to estimate the adequate stocking rate to achieve certain animal production goals and contributes with supporting information related to herbage mass targets to maintain an adequate balance between sward composition, structure and nutritive value.

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Table 1 - The effect of herbage mass accumulation (high, medium and low) during winter, spring and summer on sward characteristics and sheep bite weight.

	WINTER				SPRING				SUMMER			
	HERBAGE ACCUMULATION											
	High	Medium	Low	P[1]	High	Medium	Low	P[1]	High	Medium	Low	P[1]
HM	1880a	1513a	610 b	**	2916a	2092b	1180c	**	3046a	2175b	1172c	**
SSH	8 b	5.2 a	1.8 c	**	10.7 a	9.9 a	5 b	**	21.7 a	15.5 b	6.5 c	**
GHM	679 a	601 a	239 b	**	1681a	1300a	543 b	**	1102a	1077ab	717 b	NS
GLHM	601 a	588 a	229 b	**	1184a	1226a	472 b	**	932 ab	796 a	517 b	NS
BW[2]	199 a	148 b	128 b	**	119 a	104 ab	91 b	*	214 a	175 b	143 c	**

[1] = Significance: * P <0.05, ** P <0.01 and NS = Not Significant

[2] = It was measured only for sheep.

Note: Herbage mass (HM; kg DM ha^{-1}), Sward surface height (SSH; cm), Green herbage mass (GHM; kg DM ha^{-}), Green leaf herbage mass (GLHM; kg DM ha^{-}) and Sheep bite weight (BW; mgDM/bite).

Table 2 - Comparisons of the botanical and chemical compositions among herbage mass on offer, sheep and cattle diets (% of DM) in winter, spring and summer.

	WINTER				SPRING				SUMMER			
	Pasture	Sheep	Cattle	P[1]	Pasture	Sheep	Cattle	P[1]	Pasture	Sheep	Cattle	P[1]
Botanical composition												
GGL	39.3 b	71.3 a	66.5 a	**	46.8 b	80.5 a	78 a	**	37.6 b	78.4 a	77.8 a	**
GGS	5a	2.7b	6.5a	*	9.2a	4.3b	8.5a	*	11.6a	4b	10.6a	*
TGL	0	0	0	NS	0 a	1.13 a	0 a	NS	0	0	0	NS
TDC	55.9 a	13 c	23.3 b	**	38 a	7.4 c	12.3 b	**	45.2 a	6.6 b	11.3 b	**
W	4.8 b	12.7 a	2.9 b	**	5.9 a	6.7 a	1.2 b	**	5.7 b	10.8 a	0 c	**
Chemical Composition												
CP	10.2 b	15.9 a	12.5 b	*	9 b	12.9 a	11.3 b	*	7.4 b	10 a	9.5 a	*
ADF	49.2 a	32.4 c	38.1 b	**	47.6 a	39.6 b	39.8 b	*	51.1 a	36.8 c	43 b	**
NDF	71 a	55.6 c	63.8 b	**	74.4 a	65.5 b	72.6 a	*	79 a	64.8 c	72.7 b	**

[1] = Significance: * P <0.05, ** P <0.01 and NS = Not Significant

Note: Grass green leaf (GGL), Grass green stem (GGS), Total green legume (TGL), Total dead component (TDC), Weeds (W), Crude protein (CP), Acid detergent fibre (ADF) and Neutral detergent fibre (NDF).