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A SHEEP AND CATLLE DIET SELECTION STUDY ON A FERTILIZED NATIVE SWARD IN URUGUAY

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Abstract

This study was undertaken during winter, spring and summer 1997, located in the basaltic region of Uruguay to evaluate the effects of stocking rate (SR) and N and P fertilizer application on sward characteristics and on sheep and cattle diet selection and grazing behaviour. The treatments applied were: a) control (C; without fertilizer application using a SR of 0.9 stock units (SU)/ha), b) T1 (with N and P fertilizer application using a SR of 0.9 SU/ha), c) T2 (with N and P fertilizer application using a SR of 1.2 SU/ha) and d) T3 (with N and P fertilizer application using a SR of 1.5 SU/ha). In general, compared with C, fertilized treatments resulted in increments in sward surface height (SSH) and sheep bite weight (BW): a) winter (3, 8, 5 and 5 cm., $P < 0.01$; 79, 142, 139 and 92 mg DM/bite, $P < 0.05$), b) spring (3, 8, 5 and 6 cm., $P < 0.01$; 108, 188, 115 and 215 mg DM/bite, $P < 0.01$), and c) summer (7, 14, 11 and 8 cm., $P < 0.01$;146, 199, 182 and 131 mg DM/bite, $P < 0.05$) for C, T1, T2 and T3, respectively. In general, the nutritive value of diet selected by sheep and cattle was higher than that of the pasture on offer, and higher in sheep than in cattle: a) winter (17, 18 and 16% crude protein, CP, $P < 0.05$; 39, 37 and 41% acid detergent fiber, ADF, $P < 0.05$), b) spring (11, 14 and 11% CP, $P < 0.05$; 42, 33 and 37% ADF, $P < 0.01$), and c) summer (8, 10 and 9% CP, $P <$

0.05; 50, 40 and 45% ADF, $P < 0.01$) for pasture on offer, sheep and cattle diets, respectively. This study demonstrated the importance of fertilizing native swards to improve production, structure, nutritive value, and animal carrying capacity and animal performance. It also shows the important role that diet selection plays in determining the nutritive value of the forage eaten by sheep and cattle, and stresses the greater selective ability of sheep over cattle.

Keywords: Fertilizer, 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 adopted by livestock farmers. However, for the Basaltic region of Uruguay, little is known of the influence of this type of native swards on diet composition and quality and on grazing behaviour, particularly under mixed grazing (sheep and 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.

This study evaluates the effects of four treatments on sward characteristics and sheep behaviour: a) control (C; without fertilizer application using a SR of 0.9 stock units (SU)/ha), b) T1 (with N and P fertilizer application using a SR of 0.9 SU/ha), c) T2 (with N and P fertilizer application using a SR of 1.2 SU/ha) and d) T3 (with N and P fertilizer application using a SR of

1.5 SU/ha). Herbage mass (HM), botanical composition and sward surface height (SSH) were recorded according to the procedures described by Montossi et al. (1999).

Eight oesophageally fistulated wethers (4) and steers (4) were used in accordance with the experimental methodologies and procedures described by Montossi (1995).

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

Results and Discussion

Sward data are presented for each season in Table 1, which show that: a) in comparison with C, fertilizer application (T1, T2 and T3) resulted in higher HM and SSH values, particularly when T1 is considered, being much smaller the differences between T2 and T3, b) T1 had significantly higher values of HM and SSH than T2 or T3, being these last two treatments quite similar, with the exception of summer, where the results of T1 and T2 were similar, but different from T3 and C, c) considering items “a” and “b”, for the green components (GHM and GLHM) similar tendencies are observed among treatments and d) with the exception of spring, the higher BW values obtained in T1 and T2 compared with C and T3, reflected the higher values of HM, SSH, GHM and GLHM achieved on those treatments. The general tendency of higher sheep BWs recorded with increases in the levels of HM and SSH (particularly when green leaf is considered within the HM component) are in accordance with the results in the literature (Montossi, 1995). The influence of fertilizer application on species composition, productive potential, nutritive value and seasonal patterns of growth has been documented by Berretta et al. (1998).

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. The higher proportions of GGL in animal diets compared with pasture on offer reached values of 39 to107 %. Green grass leaf made up more than 67% of the diets of either sheep or cattle, being this component in sheep diet normally much higher than in cattle diet, with corresponding increases in the proportions of the GGS component in cattle diet. In contrast, TDC were significantly lower in sheep (54–87%) and cattle (33-80%) diets than in the pasture on offer, whereas sheep diets had significantly lower proportions of TDC than cattle diets (on average 22%). Weeds and legumes were minor components of pasture on offer or extrusa samples, being these components actively preferred by sheep in comparison with cattle. The botanical composition of the diet selected tended to match complementary information related to the composition of the uppermost layers of the sward canopies studied reported by Montossi et al. (1998). However, some differences were observed between the proportions of weeds and legumes in sheep diet compared with those of the pasture on offer and their vertical position in the sward canopy, suggesting that sheep apparently penetrated in some degree to the lower horizons of the sward canopy to select these components.

The nutritive value of sheep and cattle diets was higher than of the herbage on offer (Table 2). The nutritive value of sheep diet was generally higher than that obtained by cattle, showing the greater selecting ability of sheep compared with cattle as reported by Montossi, (1995).

In the context of the Basaltic region of Uruguay, this study demonstrates the benefits of the application of nitrogen and phosphate fertilizers to improve native pasture production, structure and nutritive value as well as its animal carrying capacity, having a clear positive effect

in increasing the nutritive value of the diet selected by animals on those pastures. It also suggests that diet selection plays a relevant role in determining the nutritive value of the forage eaten by animals and showed the greater selective ability of sheep over cattle in a broad range of circumstances.

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Table 1 - Effects of control and fertilized treatments on sward characteristics and sheep grazing behaviour during winter, spring and summer.

	WINTER					SPRING					SUMMER				
	C	T1	T2	T3	P[1]	C	T1	T2	T3	P	C	T1	T2	T3	P
HM	780c	2250a	1334b	1301b	**	692c	2283a	1237bc	1548b	**	1867b	3120a	2938a	1721b	**
SSH	3.1c	7.6a	4.6b	5b	**	2.8c	8a	4.8b	5.6b	**	7.3c	13.7a	10.8ab	7.6bc	**
GHM	286c	864a	552b	482b	**	531c	1614a	997b	1227ab	**	1021b	1848a	1661a	1102b	*
GLHM	286c	864a	552b	482b	**	336b	931a	599b	546b	*	909b	1384a	1410a	890b	*
BW[2]	79b	142a	139a	92b	*	108b	188a	116b	215a	**	146bc	199a	182ab	131c	*

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

[2] = It was measured only for sheep.

a, b, c means with different letters between colums are significantly different (P<0.05).

Control Treatment (C) = SR = 0.9 stock unit/ha, without fertiliser application.

Treatment 1 (T1) = SR = 0.9 stock unit/ha, with fertiliser application.

Treatment 2 (T2) = SR = 1.2 stock unit/ha, with fertiliser application.

Treatment 3 (T3) = SR = 1.5 stock unit/ha, with fertiliser application.

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^{-1}) and Sheep bite weight (BW; mgDM/bite).

Table 2 - Comparisons of the botanical and chemical compositions among herbage on offer and 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	39b	75a	81a	**	43c	82a	74b	**	48c	74a	67b	**
GGS	3	2	3	ns	33a	6c	14b	**	10b	5c	16a	**
TGL	0b	5a	0b	**	1b	2a	0b	*	1a	0a	0a	ns
TDC	56a	7c	11b	**	15a	7c	10b	**	37a	14b	17b	**
W	5b	11a	5 b	**	9a	4b	2c	**	4a	6a	1b	**
Nutritive value												
CP	17b	18a	16b	*	11b	14a	11b	*	8b	10a	9a	*
ADF	39a	37b	41a	*	42a	33c	37b	**	50a	40c	45b	**
NDF	73a	57b	77a	**	77a	68b	69b	*	82a	67c	77b	**

[1] = significance: * P <0.05, ** P <0.01 and ns = not significant

a, b, c means with different letters between colums are significantly different (P<0.05).

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 Acid neutral detergent fibre (NDF).