

## Feeding behavior of Santa Inês sheep in pastures of *Cynodon dactylon* and *Andropogon gayanus*

Paulo Henrique Amaral Araújo de Sousa ▪ Laylson da Silva Borges ▪ Cicero Pereira Barros Junior ▪ Barbara Silveira Leandro de Lima ▪ Diego Sousa Amorim ▪ Tiago Vieira de Andrade ▪ Wéverson Lima Fonseca ▪ Severino Cavalcante de Sousa Júnior ▪ Felipe Adalberto de Sá

**PHAA Sousa** (Corresponding author) ▪ **BSL Lima** ▪ **DS Amorim** ▪ **SC Sousa Júnior** ▪ **FA Sá**

Universidade Federal do Piauí (CPCE/UFPI), Bom Jesus, PI, Brazil.

email: paullo\_ap1@hotmail.com

**TV Andrade**

Universidade Federal de Goiás (EVZ/UFG), Goiânia, GO, Brazil.

**LS Borges** ▪ **CP Barros Junior**

Universidade Federal do Piauí (CCA/UFPI), Teresina, PI, Brazil.

**WL Fonseca**

Universidade Federal do Ceará (UFC), Fortaleza, CE, Brazil.

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**Abstract** The objective of this study was to compare the behavior of sheep in different pastures, checking for possible differences in time spent grazing, leisure, and the number of bites of animals. 10 sheep Santa Inês were used, at the age of two years, with an average weight of  $25.25 \pm 2.65$  kg. The experimental design was completely randomized with two treatments (*Andropogon gayanus* pastures and *Cynodon dactylon* cv. Vaquero) and five replicates per treatment. The trial lasted five days. Two evaluations were performed with duration of 24 hours each, for a day and the average of the two assessments was used in the statistical analysis. It may be noted that as the number of bits, the highest peak occurred in the early hours of the morning (22.16 bites per minute). Daily grazing time was higher ( $P < 0.05$ ) for grazing *Cynodon dactylon* cv. Vaquero (14.76 hours). For the time in daily idleness was observed the highest values for the pasture of *Andropogon gayanus* (12.06 hours). We conclude that the sheep had higher acceptability and grazing activity in *Cynodon dactylon* cv. Vaquero pasture.

**Keywords:** animal ethology, grazing time, leisure-time

### Introduction

Sheep farming in Brazil is predominantly determined by policies taking into account that animal performance is influenced by a number of factors related to pastoral structural characteristics and composition. Silva et al (2004) indicated that it is necessary to understand the factors such as food, environment, and types of animals that affect the feeding behavior of animals. Cirne et al (2014) reported that

such factors have direct effects on consumption patterns, selection, and production of animals.

Feeding behavior assessments are an important tool in the nutritional management of sheep so that the relationship of animals with diet during development is understood (Smith 2015).

Grazing animals' behavior, among a number of other responses, is an important part of understanding plant-animal relations in ecosystem pastures. Therefore, the study of this type of behavior can help shape decision making policies as they relate to pasture management. Burger et al (2000) indicated that the most studied parameters for evaluating animals' intake behavior include grazing activity, feeding time, rumination and idling, power efficiency and rumination, number of chews per food bolus food, time spent chewing for ruminal boluses, and number of chews while ruminating per day.

Data from the study about animal feeding behavior provides information about the links that control the responses of both the animals and the pastures (Paula et al 2010). Also, it provides information for the conventional zootechnical approach in order to improve food quality; this implies weight management, which is an important management tool for animals. This tool will enable facilitation of new innovations not previously considered in management practices (Silva et al 2004).

As a method for generating information to enable more efficient management of sheep herding to improve productivity levels, this study was done in order to evaluate the feeding behavior of the Santa Inês breed of sheep in *Andropogon gayanus* pastures and *Cynodon dactylon* cv.

Vaquero and to check possible differences in grazing time, leisure, and the number of bites for each type of grass.

### Materials and Methods

The experiment was conducted at the Research Unit in Small Ruminants at the Federal University of Piauí (UFPI), *Campus* Professor Cinobelina Elvas (CPCE) located in Bom Jesus, Piauí. The region has semi-arid, dry weather, with dry and rainy seasons during the year, common to all regions of Northeast Brazil (Borges et al. 2015). Formed pastures were used in *Andropogon gayanus* and *Cynodon dactylon* cv. Vaquero on a flat area of 1 ha<sup>-1</sup> for each grass species studied.

Ten adult Santa Ines sheep, with an average weight of 25.25 ± 2.65 kg were used. The trial lasted five days, and the assessed animals had already adapted to the pastures. Two evaluations were made lasting for 24 h. The evaluations were performed from February 1 to 5, 2014 for a total of 120 hours of observation.

The chemical analyses were performed after the samples were air-dried at a maximum temperature of 55 °C until they reached constant weights. These samples were analyzed for dry matter content (DM) and crude protein (CP), which were determined according to the procedures described by Silva and Queiroz (2006). The chemical composition of the grasses is shown in Table 1.

**Table 1** Chemical composition of grasses *Andropogon gayanus* and *Cynodon dactylon* cv. Vaquero.

Species	Dry matter (%)	Crude Protein (%)
<i>Andropogon gayanus</i>	36.2	9.4
<i>Cynodon dactylon</i> cv. Vaquero	22.1	18.9

The experimental design was completely randomized for two treatments (*Andropogon gayanus* pastures and *Cynodon dactylon* cv. Vaquero) and five replicates (animals) per treatment. The variables analyzed were the daily time for total daily grazing time, morning, later, and night grazing time, total leisure time, morning, afternoon, and night leisure times, number of seizures per minute in the morning, afternoon, and evening, and amount of daily seizures. The grazing and leisure times were obtained through observations of the animals every 10 min and the total sum of times in which the animals were observed in certain behavior. Morning consisted of the hours 07:00 to 12:00h, afternoon from 12:00 to 19:00, and night included the period between 19:00 and 07:00. The daily observation period was 24 h each day. The grazing time included the search and seizure

activities of foraging, while the leisure time referred to all the extra activities, rumination, and grazing.

The seizure rate was obtained by direct count of the number of seizures observed within one min, the result being the average of observations every 10 min when the animals were grazing. The number of daily seizures was calculated by multiplying the average rate of seizures and daily grazing time in min. Data related to grazing and leisure times, and the rate and number of observed daily seizures were subjected to analysis of variance and means compared by Tukey test at 5% probability using the SISVAR statistical software, version 5.3 (Ferreira 2011).

### Results and Discussion

Table 2 shows that there was a significant difference between the pasture and monitored shifts ( $P < 0.05$ ) where grazing sheep spent more time in grass *Cynodon dactylon* cv Vaquero during the day with an average of 10.80 h grazing time mostly in the early hours of morning and late afternoon. These findings agree with those from other studies (Jochims et al 2010; Santos et al 2011; Marques et al 2012). The recorded variation times for cattle and sheep are similar, ranging between 4.5 and 14.5 h (Son et al. 2001). Parente et al (2007) evaluated the feeding behaviors of lambs and sheep grazing on Tifton 85 (*Cynodon* ssp) in northeastern Brazil and observed that lambs and sheep grazed for a longer time (7.50 h) than ewe lambs (6.25 h). The values obtained in this study are higher than those reported by Parente et al (2007).

Regarding the night grazing showed no significant difference ( $P > 0.05$ ) between pastures (Table 2), which had the lowest grazing time in the study and can be explained partly by the fact that the overnight animals spent a great amount of the time lying idle and ruminating (Table 3). The time spent in rumination is longer at night, but the periods of rumination are also the rhythmical with the supply of food. However, there are differences between individual animals regarding the duration and repetition of these activities (Scharf et al 2008; Figueiredo et al 2013).

In relation to the total daily grazing time were no statistical differences ( $P < 0.05$ ) in relation to types of pastures (Table 2), indicating that the animals in this experiment changed their grazing habits as the type of grass was modified daily grazing time were over 14 h. However sheep selected the leaves at grazing time, and in order to do this they need to move to other the pastures, thus causing an increase in the power (movement) period (Marques et al. 2012). This explains the superiority of daily grazing in *Cynodon* grass *dactylon* cv. Vaquero, having more acceptability by the animals due to its content of crude protein (18.9%) (Table 1). These values were higher than those found by Oliveira et al. (2013) in which the authors

found 15.58% in crude protein composition of whole plant and different percentages for leaf and cv. Vaquero. It is

valid to point out that there are few studies reporting the bromatological analysis of this cultivar.

**Table 2** Grazing time (hours) of Santa Ines sheep during day and night shifts and daily in different pastures.

Grass species	Grazing time		
	Daytime	Night	Daily
<i>Andropogon gayanus</i>	8.16 <sup>bA</sup>	3.76 <sup>aB</sup>	11.93 <sup>b</sup>
<i>Cynodon dactylon</i>	10.80 <sup>aA</sup>	3.96 <sup>aB</sup>	14.76 <sup>a</sup>
CV (%)	2.61		7.5

Means followed by the same lower case in the column and same upper case in the line does not differ (P<0.05) by Tukey test at the level of 5% probability.

High crude protein levels in pastures are desirable because in general administering protein supplements to ruminants yields higher costs in supplements. It is more economical to obtain nutrients via pasture feeding (Silva et al 2008). Significant differences (P < 0.05) between the two pastures *Andropogon gayanus* and *Cynodon dactylon* cv. Vaquero for the study periods (Table 3) were observed with the longest being observed in nighttime idleness (8.23 hours). Higher peaks of bites and grazing occurred during the day and agreed with the finding that grazing time was lower at night (Table 2). These results agree with a study by Calviello et al (2013), in which the authors found values similar to those in the present study.

There was a significant difference (P < 0.05) in daily leisure time (Table 3) for the study pastures, in which the highest average was recorded in *Andropogon gayanus* grass (12.06 hours). These results showed that the animals were more selective and thus preferred the *Cynodon* grass *dactylon* cv. Vaquero, which shows the highest average number of bites (Table 4).

This parameter is indicative of grazing animal consumption and the structure of the pasture (Barros et al 2007). Consumption is summarized by the sum of bites performed by the animal and is related to their performance. Animals with greater opportunities to obtain an adequate quantity and quality of food lead to an increase in production (Paula et al 2010).

In table 4 it can be seen that there was significant differences in bite rates for both *Cynodon dactylon* grass cv. Vaquero and *Andropogon gayanus* (P < 0.05). The number of bites per minute was lower for the animals in the pasture *Andropogon gayanus* (15.80 bites per minute) in the morning shift, while for *Cynodon dactylon*, the value was 22.16 bites per minute. This difference can be explained by the fact that the animals grazed more intensely in *Cynodon* grass *dactylon* (Table 2). This trade-off between bite rate and grazing time is reinforced by the findings of Provenza and Balph (1990).

**Table 3** Leisure time (hours) of Santa Ines sheep in the day, night shifts and daily in different pastures.

Grass species	Grazing time		
	Daytime	Night	Daily
<i>Andropogon gayanus</i>	3.83 <sup>aB</sup>	8.23 <sup>aA</sup>	12.06 <sup>a</sup>
<i>Cynodon dactylon</i>	1.19 <sup>bB</sup>	8.03 <sup>aA</sup>	9.23 <sup>b</sup>
CV (%)	3.27		9.4

Means followed by the same lower case in the column and same upper case in the line does not differ (P<0.05) by Tukey test at the level of 5% probability.

Parente et al (2007) evaluated the feeding behaviors of lambs, borregas, and sheep grazing on Tifton 85 and found that there was a difference in the statistics for the number of bites per minute; for the sheep the number of bites per minute was 21.12. The average number of bites in Parente's study were higher than in the present study.

According to Trevisan et al (2004), the measure of the bite rate is an estimate that facilitates occur forage seizures, which is related to the time the animal dedicates to grazing.

The number of bites in the evening showed a significant difference depending on pasture type (P < 0.05). More bites were detected for the grass *Cynodon dactylon* cv. Vaquero (13.27 bites per minute). Filho et al (2001) reported that in the early and mid-morning periods, early afternoon, and near sunset, longer periods of grazing occurred. Ruminants perform 65%–100% of their grazing activity between 6:00 and 19:00 (Shaw et al 2006; Medeiros et al 2007; Bernabucci et al 2009). The number of bites per

minute daily was statistically different ( $P < 0.05$ ) for the different grasses that were studied, with the greatest number of bites in *Cynodon dactylon* cv. Vaquero pasture. This

finding showed that the grass in question had good palatability and was accepted more readily by the animals.

**Table 4** Number of bites per minute of Santa Inês sheep in the morning, afternoon, evening Gazette and in different pastures.

Grass species	Grazing time			
	Morning	Afternoon	Night	Daily
<i>Andropogon gayanus</i>	15.80 <sup>bA</sup>	7.70 <sup>bB</sup>	3.76 <sup>BC</sup>	9.09 <sup>b</sup>
<i>Cynodon dactylon</i>	22.16 <sup>aA</sup>	13.27 <sup>aB</sup>	3.86 <sup>BC</sup>	13.09 <sup>a</sup>
CV (%)	11.64			14.27

Means followed by the same lower case in the column and same upper case in the line does not differ ( $P < 0.05$ ) by Tukey test at the level of 5% probability.

## Conclusions

The study sheep had higher grazing times during the day and a higher frequency of bites for *Cynodon dactylon* cv. Vaquero pasture with less time on daily leisure. Thus, it is recommended to producers South of Piauí state that *Cynodon dactylon* cv. Vaquero pasture is used as it has a higher crude protein content and acceptability by the animals. It appears to provide the best performance for small animals, thus improving the profitability of producers in the region.

## References

Barros CS, Dittrich JR, Rocha C, Silva CJA, Rocha FMP, Monteiro ALG, Bratti LFS, Silva ALP (2007) Comportamento de caprinos em pasto de *Brachiaria hibrida* vc. Mulato. Revista da Faculdade de Zootecnia, Veterinária e Agronomia 4:187-206.

Bernabucci U, Lacetera N, Danieli PP, Bani P, Nardone A, Ronchi B (2009) Influence of different periods of exposure to hot environment on rumen function and diet digestibility in sheep. International Journal of Biometeorology 53:387-395.

Borges LS, Sousa PHAA, Evangelista AF, Fernandes GF, Araújo AC, Barros Jr CP, Fonseca WJL, Sousa Jr SC (2015) Adaptabilidade climática de vacas mestiças Holandês x Gir sobre características termorreguladoras na microrregião do alto médio Gurguéia. Revista Eletrônica Nutritime 12:4131-4135.

Burger PJ, Pereira JC, Queiroz AC, Silva JFC, Valadares filho SC, Cecon PR, Casali ADP (2000) Comportamento ingestivo em bezerros holandeses alimentados com dietas contendo diferentes níveis de concentrado. Revista Brasileira de Zootecnia 29:236-242.

Calviello RF, Titto CG, Amadeu CCB, Titto EAL (2013) Avaliação do comportamento de ovelhas em pastejo durante 24 horas. Revista Brasileira de Zootecnia 3:139-145.

Cirne LGA, Sobrinho AGS, Santana VT, Endo V, Almeida FA, Franco MR, Silva FU, Oliveira, EA, Carvalho GGP, Zeola NMBL (2014) Efeito da tosquia estratégica no comportamento ingestivo de ovelhas Ile de France em pastagem de capim vaquero (*Cynodon dactylon* cv. Vaquero) durante a estação de monta. Semina: Ciências Agrárias 35:1607-1616.

Ferreira DF (2011) SISVAR: Um sistema computacional de análise estatística. Revista Ciência e Agrotecnologia 35:1039-1042.

Figueiredo MRP, Saliba EOS, Borges I, Rebouças GMN, Aguiar e Silva F, Sá HCM (2013) Comportamento ingestivo de ovinos alimentados com diferentes fontes de fibra. Arquivo Brasileiro de Medicina Veterinária e Zootecnia 65:485-489.

Filho HO, Barbosa OR, Sakaguti ES, Onorato WM, Macedo FAF (2001) Efeito da sombra natural e da tosquia no comportamento de ovelhas das raças Texel e Hampshire Down, ao longo do período diurno, no Noroeste do Estado do Paraná. Acta Scientiarum 4:981-993.

Jochims F, Pires CC, Griebler L, Bolzan MAS, Dias FD, Galvani DB (2010) Comportamento ingestivo e consumo de forragem por cordeiras em pastagem de milho recebendo ou não suplemento. Revista Brasileira de Zootecnia 3:572-581.

Marques JA, Prado IN, Silva PA, Strada ESO, Santana ALA, Pinheiro EEG, Mercês LM, Santos LM (2012) Comportamento ingestivo de diferentes categorias de ovinos Santa Inês em pastejo contínuo em *brachiaria decumbens*. Revista ciências exatas e da terra 7:37-44.

Medeiros RB, Pedrosa CES, Jornada JBJ, Silva MA, Saibro JC (2007) Comportamento ingestivo de ovinos no período diurno em pastagem de azevém anual em diferentes estádios fenológicos. Revista Brasileira de Zootecnia 36:198-204.

Oliveira ER, Monção FP, Goes RHTB, Lempp B, Gabriel AMA, Moura LV, Pereira TL (2013) Estimativa da massa seca de genótipos do gênero *Cynodon* pelos Métodos de forno de microondas e convencional. Boletim de Indústria Animal 70:174-186.

Parente HN, Zanine AM, Santos EM, Ferreira DJ, Oliveira JS (2007) Comportamento ingestivo de ovinos em pastagem de tifton 85 (*Cynodon spp*) na Região Nordeste do Brasil. Revista Ciência Agronômica 38:210-215.

Paula EFE, Stupak EC, Zannata CP, Poncheki J K, Leal PC, Monterio ALG (2010) Comportamento ingestivo de ovinos em pastagens: Uma revisão. Revista Trópica - Ciências Agrárias e Biológicas 4:43-51.

Provenza FD, Balph DF (1990) Aplicabilidade das cinco dietas modelos de seleção para vários ruminantes desafios de forrageamento encounters In: Hughes, RN, (Ed.) mecanismos comportamentais de seleção de alimentos. 2. ed. Berlin: NATO ASI, 20:423 459.

Santos MM, Azevedo M, Costa LAB, Silva Filho FP, Modesto EC, Lana AMQ (2011) Comportamento de ovinos da raça Santa Inês, de diferentes pelagens, em pastejo. *Acta Scientiarum Animal Sciences* 33:287-294.

Scharf B, Wax LE, Aiken GE, Spiers DE (2008) Regional differences in sweat rate response of steers to short-term heat stress. *International Journal of Biometeorology* 52:725–732.

Shaw RA, Villalba JJ, Provenza FD (2006) Influence of stock density and rate and temporal patterns of forage allocation on the diet mixing behavior of sheep grazing sagebrush steppe. *Applied Animal Behaviour Science* 100:207-218.

Silva DJ, Queiroz AC (2006) *Análises de Alimentos*. 3ed. Universidade Federal de Viçosa, Imprensa Universitária 235.

Silva RR, Magalhães A F, Carvalho GGP, Silva FF, Franco IL, Nascimento PV, Bonomo PP (2004) Comportamento ingestivo de novilhas mestiças de holandês suplementadas em pastejo de *brachiaria decumbes*: aspectos metodológicos. *Revista Electrónica de Veterinaria* 5:1-6.

Silva SC, Júnior DN, Euclides VPB (2008) *Pastagens: conceitos básicos, produção e manejo*. 1. ed. Viçosa: Suprema, 115p.

Silva WAS (2015) Comportamento ingestivo e eficiência alimentar de cordeiros confinados. Dissertação, Universidade Estadual do Sudoeste da Bahia.

Trevisan NB, Quadros FLF, Silva ACF, Bandinelli DG, Martins CEN, Simões LFC, Maixner AR, Pires DR (2004) Ingestive behaviour of beef steers grazing oat and italian ryegrass pasture with different levels of green leaves. *Ciência Rural* 34:1543-1548.