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# Ingestive behavior and performance of female lambs grazing on Marandu palisadegrass under different stocking rates[1]

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**ABSTRACT** - The ingestive behavior and performance of female lambs grazing on Marandu pasture submitted to different stocking rates during the rainy and transition season were evaluated. The experimental area with 4,500 $m^2$ was divided into 45 paddocks of 100 $m^2$. Twenty-seven Santa Ines female lambs (purebred) with 4 months age and 22 kg of initial body weight were distributed in a completely randomized design, with nine replicates. Lambs were divided into 9 groups with the same initial weight and submitted to three stocking rates: 2, 3 and 4 lambs/paddock, which corresponded to 40, 60 and 80 lambs/ha, respectively. Each group of animals had a module of five paddocks, managed on intermittent grazing system, with 7 days of occupation and 28 d of rest. Increase on time grazing and reduction on time ruminating and resting were observed as stocking rates increased. There was 14% raise in time grazing and 41% decline on time resting by lambs subjected to the highest stocking rate compared with those in the lower stocking rate. The number of animals/ha promoted linear effect on average daily gain, which was higher for animals in the lowest stocking rate of 90 g/d. For gain per area, the best result was obtained with 60 animals/ha featuring an average value of 426 kg/ha.

Key Words: average daily gain, gain per area, grazing, resting, rumination, sheep

## Introduction

Ruminant production under grazing conditions presents, as main advantage, the low costs, since animals harvest their own forage, which reduces manpower, machinery and fuel spending. However, on systems based on pasture, there are factors related and conditioned to grazing process which interfere on energy losses due to search for food, diet selection, time grazing and, consequently, forage intake (Carvalho et al., 2009).

On systems based on pasture forage, intake is the main factor to determine animal performance. According to Van Soest (1994), dry matter intake (DMI) determines the amount of nutrients and, thus, animal response. Mertens (1994) reported that changes on feed intake account for 60 to 90% of variations in animal performance.

According to Poppi et al. (1987), the main regulating factors of forage intake can be grouped into two categories, non-nutritional and nutritional factors. The non-nutritional may also be called behavioral factors, and determine the influence of forage characteristics on feeding behavior (Hodgson, 1990). Among them, forage mass (kg/ha), height sward (cm), density, and leaf:stem relation stand out. Nutritional factors are related to crude protein and neutral detergent fiber content and dry matter (DM) digestibility of forage.

Changes in the sward structure can influence the habit of forage intake, including changes on weight, number and rate of bites, which affects time eating, ruminating and resting (Da Silva & Nascimento Junior, 2007). The principal means to promote changes in the sward structure is by pasture management, working with intensity and frequency of grazing.

The management of perennial grasses has to conciliate conflicts between plants and animals, allowing high efficiency of harvest, and the recovery of plants after grazing, keeping competitiveness and productivity in a given area. Considering that sheep on pastures prefer to select nutritive parts of plant such as green leaf, it means that maintenance of adequate supply of this component allows high performance of the animals (Carvalho et al. (2009).

The amount of green leaf blades to optimize forage intake by grazing animals has to be established, particularly regarding differences among species of forages, ruminants and their behaviors. While care with the maintenance of a

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high proportion of this morphological component in pastures, it is expected that the efficient grazing reduces losses due to the senescence (characteristic of pasture under continuous stocking grazing), a fact commonly observed in pasture of continuous stocking in the rainy season, allowing not only elevated animal production, but also per unit of area (Carvalho et al., 2009; Da Silva & Nascimento Júnior, 2007).

Some studies evaluating the behavior (Sarmento, 2003) and performance (Molan, 2004) of cattle grazing palisadegrass (*Brachiaria brizantha* cv. Marandu) and sheep grazing temperate grasses (Roman et al., 2007) have been carried out. However, studies about the potential of production and behavior of sheep reared in palisadegrass pasture are scarce.

According to Macedo (2005), 50% of the cultivated pastures in the Midwest of Brazil are composed of palisadegrass. However, there are some restrictions on its use to sheep, since many producers, technicians and researchers consider this grass of low nutritional value and, in some cases, responsible for the photosensitization in sheep graze. But, considering the importance of this forage to Mato Grosso state, especially cultivar Marandu, studies become necessary to evaluate the potential of sheep production on these pastures.

Therefore, the objective of this study was to evaluate the performance and behavior of sheep in palisadegrass pasture under different stocking rates.

## Material and Methods

The experiment was carried out during February to May of 2008 at the Setor de Ovinocultura da Fazenda Experimental of Universidade Federal de Mato Grosso, in Santo Antonio do Leverger (15°51'56"S, 56°04'36"W, and an altitude of 141 m). The climatic conditions observed during the experimental periods presented means values of 31.57 and 21.47 °C for maximum and minimum environmental temperature, 82.57% for the relative humidity and 44.4 mm for precipitation (Table 1).

The experimental area amounted to 4,500 $m^2$ of pasture composed of Palisadegrass *(Brachiaria brizantha* cv. Marandu), formed in February 2007. The area was divided into 45 paddocks of 100 $m^2$ each, using a four-wire electric fence.

Twenty-seven Santa Ines female lambs (purebred) with an average of 4 months of age and initial body weight (BW) of 22 kg were distributed in a completely randomized design, with nine replicates. The experimental animals were separated in nine groups with homogenous weights and distributed to three stocking rates (SR), defined as 2, 3 and 4 animals/paddock, which corresponded to 40, 60 and 80 lambs/ha, respectively.

Each group of animals placed a module of five paddocks, managed under rotational stocking system with seven days of occupation and 28 days of rest. After grazing, each paddock was fertilized with 250 kg/ha of NPK 10:10:10 formula.

Paddocks were provided with feeders, troughs and shelter. The mineral supplement was offered *ad libitum*, containing the following nutrients per kg: Ca: 155 g, P: 65 g, S: 12 g, Mg: 6 g, Na: 115 g, Co: 175 mg, Cu: 100 mg, Fe: 1,000 mg, F: 650 mg, I: 175 mg, Mn: 1,400 mg Ni: 42 mg, Se: 27 mg, Zn: 6,000 mg.

Endoparasite control was performed 15 days before the beginning of the experiment. Animal weightings occurred in the beginning and at the end of each experimental period (35 days), without previous fasting. During weighting, samples of feces were collected for subsequent egg counting (EPG), using Gordon & Whitlock modified technique (Ueno & Gonçalves, 1988). Lambs were dewormed when EPG counts were above 700.

Mean height values of sward were obtained measuring 10 points within each paddock, before and after grazing, and used to choose the spot for forage sampling. Sampling was carried out inside a square of 0.5 × 0.5 m, with cut at 5 cm of height, which was followed by weighing, homogenization and division into two subsamples: one to evaluate forage mass (kg/ha of DM), and the other one divided in fractions of leaf, stem (stem + sheath) and dead material. The amount of each fraction (kg/ha) was obtained by multiplying the

Table 1 - Mean values of maximum and minimum temperature, humidity and precipitation[1]

| Month | Temperature (°C) | | Relative humidity (%) | Precipitation (mm) |
|---|---|---|---|---|
| | Maximum | Minimum | | |
| February | 32.7 | 22.8 | 81.5 | 51.8 |
| March | 32.5 | 22.9 | 82.7 | 54.9 |
| April | 31.6 | 21.3 | 82.9 | 53.2 |
| May | 29.5 | 18.9 | 83.2 | 17.1 |

[1]Agrometeorological station "Padre Ricardo Remetter" – Experimental UFMT Farm.

forage mass by the percentage of specific fraction. The leaf:stem relation was calculated by dividing the weight of green leaf by the weight of stem, on a dry matter basis.

From estimates of the forage mass and leaf blades available, expressed in kg of DM/100 kg of BW, the forage offer was calculated. The accumulation rate was achieved by dividing the difference between forage mass prior and post grazing by a period of 28 days.

The contents of dry matter (DM), crude protein (CP), neutral detergent fiber (NDF) and ash of green leaf fraction were determined according to Silva & Queiroz (2002).

The feeding behavior of animals was assessed one day before the end of each experimental period, from 8:00 AM to 5:00 PM, observing the activities of grazing, rumination, rest and water or mineral intake at every 15 minutes. Only activity happening in moment of observation was considered.

The weight gain of animals (WG) was calculated by the difference between weighing dates. The average daily gain (ADG) was obtained dividing the WG by the total of experimental period days. Weight gain per area was calculated by multiplying number of animals per hectare in each stoking rate and their respective WG. The statistical model used was $Y_{ij} = \mu + SR_i + \varepsilon_{ij}$, where $Y_{ij}$ = response variables from each replication; $\mu$ = the overall mean; $SR_i$ = the effect of stocking rate, i = 1, 2, 3; and $\varepsilon_{ij}$ = the random error effect associated to the $ij^{th}$ observation.

Data were submitted to variance and regression analysis ($\alpha = 5\%$), using SAEG software (UFV, 2001).

## Results and Discussion

The mean values of forage offer on stocking rates (SR) of 40, 60 and 80 lambs/ha were 11.7, 14.0 and 3.3 % BW/day. Results were 1,906; 1,485 and 1,091 kg/ha DM for leaf blade, sward height of 61.0; 55.0 and 50.0 cm and 0.31, 0.29 and 0.26 for leaf:stem relation on SR of 40, 60 and 80 lambs/ha, respectively. Time grazing (Figure 1) increased (P<0.05) for the higher stocking rates, whereas an inverse response was observed for ruminating and resting. Since activities are mutually exclusive, for 60 and 80 animals/ha, there was less time for rumination and reduction of 41% on resting time, compared with the lower SR (P<0.05).

Considering that the green leaf blade available on SR of 60 and 80 lambs/ha was equivalent to 78 and 57%, respectively, compared with 40 lambs/ha, it could be supposed that the amount of this morphological component should influence animal behavior. It is likely that the increase on time grazing observed at higher SR (60 and 80 lambs/ha) could be attributed to increments in the number of bites. These results are corroborated by Castro (2002), who reported that at smaller sward heights, lambs tend to walk more and intensify events of searching and harvesting of forage, considered as grazing activities in the present study.

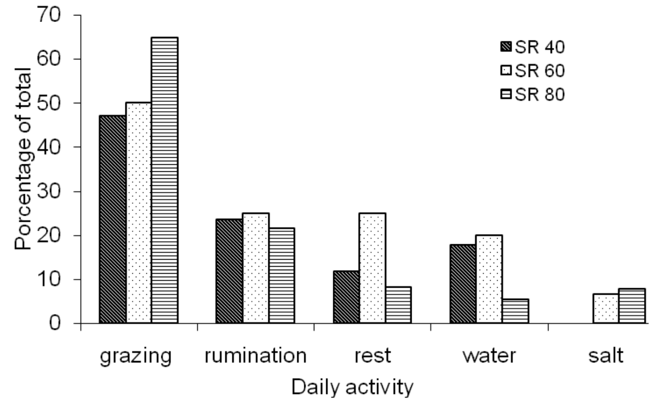


Figure 1 - Behavior of lambs as a function of palisadegrass pasture stocking rates (SR) during the rainy season and the transition of rainy to dry season period.

The size of bites diminished, whereas the number and time of grazing tended to increase on conditions of forage restriction as a way to compensate the low forage availability (Carvalho et al., 2009). Therefore, with 80 lambs/ha, higher time of grazing due to low rates of intake was observed, which was limited by structural characteristics of the sward and a stressful environment. Gontijo Neto et al. (2006), evaluated steers in Tanzania grass pasture, and also observed high values of grazing with low availability of forage.

According to Penning et al. (1991), the sward height, compared with other structural parameters, is the factor that most influences the size of bite, with consequent impact on animal performance. Interestingly, in this experiment, specifically for the higher stocking rate, animals were damaged by lower sward height, especially due the low of leaf:stem relation mentioned above.

For the average proportion of leaf blade, there was no effect (P>0.05) of stocking rates applied. However, when evaluated in the post-grazing, this variable linearly decreased with the stocking rates of 40, 60 and 80 lambs/ha, with values of 13.93, 9.77 and 7.15%, respectively. Minson (1990) reported that when the animal is accustomed to eating leaves, their instinct is to search for them, even in small proportions, which can also contribute to the increase in time devoted to grazing. In addition, the percentages of the stem + sheath, by stocking rates employed remained above 60%, which may have limited the selective ability of animals, inducing to spend more time in the search of the stratum to eat.

There was a linear decrease effect (P<0.05) on average daily gain (Figure 2), which reduced 1.101 g for every increased unit in the stocking rate (animals/ha). In contrast, average daily gain was positively related to the offer of fodder, especially for green leaf blade, which increases with the reduction in the number of animals under grazing.

The lowest SR allowed gains of 90 g/d, while animals at 60 to 80 lambs/ha obtained 67.64 and 45.62 g/d of ADG, respectively. This drop probably refers to reductions in the total amounts of forage mass and green leaf blade at higher stocking rates. Interestingly, the lowest ADG were also related to an increase in the time of grazing.

According to Minson (1990), available forage should be above 2,000 kg/ha of DM, as a minimum that could limit dry matter intake. Euclides et al. (2001) reported that, to achieve a high animal performance it is necessary potentiate feed intake, especially offering pastures with sufficient density of leaves and low proportion of dead material and stems, not to promote stress during grazing. According to them, even on pastures with high amount of leaf, major portion could be represented by low nutritional value components.

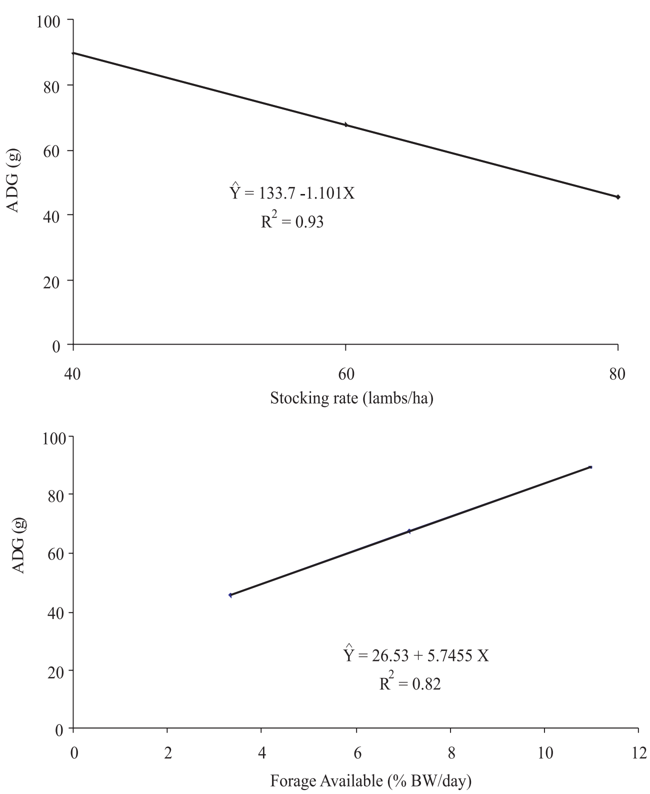


Figure 2 - Average daily gain (ADG) of lambs estimated as a function of stocking rate and forage available.

The highest ADG was obtained in the lowest SR, but the largest gain per area (P<0.05) occurred with 60 lambs/ha (426 kg/ha), with observed values of 378 and 383 kg/ha for stocking rates of 40 and 80 lambs/ha, respectively (Figure 3). The highest SR did not correspond to the highest gain per area, probably due to the lower ADG (45.62 g/animal/day), related to small amount of forage and green leaf blade available.

Carnevalli et al. (2001a, 2001b) reported weight gain of 35-70 g and 35-90 g/d to sheep kept in Tifton 85 and Coastcross pastures, respectively. These values resemble the ADG (50 g) obtained by Bianchini et al. (1998) for finishing lambs on Coastcross pasture. Roman et al. (2007) related a positive linear effect of ADG and increase of ryegrass availability; however, on the range of forage mass evaluated, these authors did not observe differences on weight gain per area.

The lamb meat production under conditions of intensive grazing in Brazil has been limited by the misguided recommendation that sheep prefer low grazing. This suggestion is based on differences between the grazing preferences of sheep and cattle in distinctive conditions, in order to optimize harvest and forage intake. However, data presented in this research show that palisadegrass needs to be managed in a way to enable selection by animals, which should reduce the grazing time and, simultaneously, achieve high intake of forage and nutrient.

The pastures that were submitted to higher stocking rates presented a low sward height and promoted the lowest individual performance, which might limit meat production of lambs in grazing systems. Considering initial weight of 20 kg and slaughter weight of 35 kg, with the observed ADG in this study, 167, 222 and 329 days would be necessary to finish animals managed on stocking rates of 40, 60 and 80 lambs/ha, respectively.

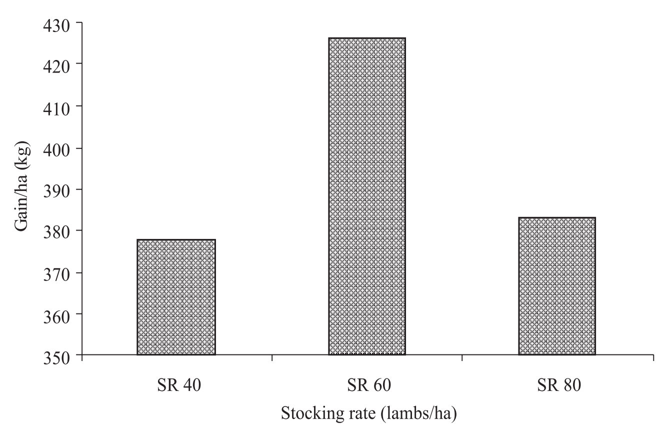


Figure 3 - Average weight gain per area as a function of stocking rate (P<0.05).

## Conclusions

The use of stocking rate of 40 lambs/ha is recommended when the objective is finished animals to slaughter. However, if the objective is gain per area, a rate of 60 lambs/ha permits better results. The stocking rate of 80 lambs/ha leads to longer grazing time and less rest, with consequent low animal response.

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