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Grazing methods and herbage allowances effects on animal performances in natural grassland grazed during winter and spring with early pregnant ewes

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ABSTRACT

The experiment was carried out in an 8.4 ha natural grassland area, subdivided into 12 experimental units, each one of 0.7 ha for 196 consecutive days, divided into seven 28-day periods. During the first 84 days (winter, periods 1–3), pregnant ewes were submitted to two grazing methods (continuous and rotational stocking; CS and RS) and two herbage allowances (HA; 12 and 18 kg DM/100 kg live weight (LW)), resulting in four treatments: C18, C12, R18 and R12. From day 85 on (pregnancy final third), all paddocks were managed with C18 to avoid food restrictions. It was measured on pasture:herbage mass (HM), net herbage accumulation, green leaf mass (GLM); and on animals:ewe body condition score (BCS), daily weight gain (DWG), lambs birth weight and animal production per area (ewes, lambs and total LWG/ha). During the first 84 days, HM was similar in the treatments and differed over the periods. After day 85, the HM was higher in RS and in 18% HA treatments. The changes in the HM cause modifications in the GLM. From period 1 to 3, ewes DWG was affected only by the HA treatment. In the 18% HA, pregnant ewes presented a positive weight gain, and in the 12% HA treatment the ewes lost weight. The grazing methods and HA did not have significant effect on the lamb birth weight. The grazing methods and the HA did not have significant effect in the DWG of the ewes but, in spring, the RS method promoted, on average, 7.3 kg/ha less ewe weight than CS. The DWG from the lambs was not affected by the treatments. Areas managed with C12 treatment in winter presented superior lambs LWG/ha than areas managed with R18. The R18, R12 and C18 were similar. The C12 treatment improved the TLWG/ha, compared to the R18 treatment, but it was similar to C18 and R12. Variations in grazing methods combined with HA in the beginning of pregnancy did not affect lambs weight at birth. High stocking rate in winter in a continuous stocking was shown to have the highest productivity.

1. Introduction

In Southern Brazil, livestock production is conducted on natural grassland areas and has a well-known importance to local economy. Besides that, it contributes to maintain the natural biodiversity, natural beauty of pastoral environments and to provide jobs in rural areas (Nabinger et al., 2000). On the other hand, during the winter season, the

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natural pasture presents a reduction in the quantitative and qualitative production characteristics (Moojen and Maraschin, 2002) and this reduction creates a major nutritional challenge for ruminants, mostly ewes.

According to NRC (2007), during the year, ewes present different physiologic stages with a modification of their demands in quantity and quality of food. Among these stages, pregnancy and lactation are the most important phases, mostly due to the major changes in nutritional requirements. However, pregnancy could be divided into two distinct phases. During the first 90–100 days, ewe nutritional requirements practically do not present important changes, and can be compared with nonpregnant animal requirements (NRC, 2007). From 90 days until birth this situation changes. During this period, the body finishes the placenta and starts to produce the fetal tissues, significantly increasing ewe nutritional requirements (Rattray et al., 2007).

Thus, the synchronization of early pregnancy with the periods when the natural grassland is out of its growing season (low winter temperatures), when its quality and growth rate are low, becomes an important management tool for use of this natural resource. In order to synchronize food offered and animal demand, the lambing needs to occur in the spring season, when the temperature increases, starting a new growing season and the sward quality improves, mostly by the production of new leaves (Richards, 1993). Despite that, according to Nabinger (2002), the imposed management during cool season will determine the quality and quantity of the re-growth herbage in spring. As the animal performance is linked to the intake and food characteristics (Minson, 1982), those changes become very important to natural grassland production systems and might have an important influence on animal performance and lambs birth weight. However, it is still not clear how the cool season pasture management (during the early pregnancy period) could influence animal and natural grassland performance.

Usually, the manager has two main options to decide how to use the pasture: (i) grazing methods, represented mainly by the continuous or rotational stocking management, and (ii) the choice of the herbage allowance and its consequent stocking rate. These are important tools that can have significant effect on animal and pasture characteristics.

The objective of this study was to determine the influence of grazing methods (continuous and rotational) with a relatively low or high herbage allowance (12 and 18 kg DM/100 kg LW) in the first 84 days of gestation on lambs birth weight, lambs and ewes average daily weight gain and lambs weight gain per area unit.

2. Materials and methods

2.1. Experimental site, grassland, treatments and grazing management

The study was conducted at a natural grassland area in the Experimental Agronomic Station of Universidade Federal do Rio Grande do Sul, Brazil. The area is located in the region called Central Depression of Rio Grande do Sul, Campos Grassland (Allen et al., 2011), at an altitude of 46 m, located at 30° 05′ south latitude, 51° 40′ west longitude. The climate is humid subtropical (Cfa) according to the Köppen classification (Moreno, 1961). The local mean precipitation is 1440 mm and the mean temperatures vary between 9 and 25 °C, according to the season (Bergamaschi and Guadagnin, 1990). The floristic composition of the study area was measured using the Botanal Method (Tothill et al., 1992) and its biomass was composed of 32.5% *Andropogon lateralis*, 14.4% *Paspalum notatum*, 9.3% *Eragrostis plana*, 6% *Aristida spp.*, 5.3% *Paspalum plicatulum*, 5.2% *Eryngium horridum*, 3.4% *Coelorhachis seloana*, 2.9% *Paspalum dilatatum*, 2.5% *Piptochaestium montevidensis*, 1.6% *Axonopus affinis*, 1.3% *Sporobulus indicus*, 0.8% *Eragrostis airoides*, 0.6% *Elyonorus spp.*, 0.3% *Stipa spp.*, 0.3% *Desmodium incanum,* 0.2% *Vernonia nudiflora*, 0.2% *Cynodon dactylon*, 1.5% *Cyperaceae*, 0.4% *Juncaceas and* 10.6% *other species.*

An 8.4 ha area of natural grassland was subdivided into 12 experimental units, each one of 0.7 ha, where a group of six early pregnancy Suffolk ewes were kept. They were 3-years old with mean live weight of 46.72 ± 4.15 kg and a body condition score (BCS) of 2.5 ± 0.4 at the beginning of the experiment. The ewe reproductive cycle was synchronized, and when the trial started, they were at 7–14 days of pregnancy. Texel rams were used for mating. The experiment was carried out over seven consecutive 28-day periods, from June 19th to December 31th, comprising 196 days. In order to uniformize the plots, 90 days before the beginning of the experiment, the total experimental area was mowed.

During the first 84 days (periods 1, 2 and 3; winter season), early pregnancy ewes were submitted to two grazing methods (continuous and rotational stocking; CS and RS) and two herbage allowances (HA; 12 and 18 kg DM/100 kg live weight (12% and 18% LW)), resulting in four different treatments: continuous 18% HA (C18), continuous 12% HA (C12), rotational 18% HA (R18) and rotational 12% HA (R12). The CS consists in keeping the ewes in paddocks without subdivisions. In the RS, the paddock was subdivided into six small paddocks, and the ewes were kept in each subdivision for seven days. On day 85 (beginning of the final third of pregnancy; period 4), until the end of the experiment, all the paddocks and ewes were submitted to the CS method with 18% herbage allowance (C18). Such adjustment was made to avoid food restrictions in this phase (final pregnancy stage and lactation). As the management was similar from the day 85 to 196, the differences found in this period were results from the periods when treatments were applied. Despite the change in the management on day 84, the test animals were kept in the same site until the end of the trial (C18, C12, R18, and R12).

An adjacent two hectare area, composed with conditions of the experimental units, was provided to the "put-and-take" animals when they are not in use. The herbage allowance (HA) was adjusted every 28 days using "put-and-take" ewes (same age and physiological state as tester ewes). In the HA calculation, the tussocks as well the inter-tussocks species were included (all above ground mass). Adjustments to keep HA under the protocol were made by the addition or removal of the "put-and-take" ewes every