Feeding Behavior of Steers on Natural Grasslands of Southern Brazil

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Key words: Diet selection, forage intake, grazing, movement path

Introduction

Ruminants face challenges in efficiently collecting feed from heterogeneous environments, where forage availability varies in space and time (Ginane et al., 2015). Movement and foraging decisions determine the temporal and spatial patterns of defoliation and impacts on vegetation. Thus, level and sustainability of livestock production depend on spatial-temporal behavior. The objective of this study was to evaluate the feeding behavior of beef cattle grazing native grasslands with varying fertilizer and seed input levels.

Materials and Methods

This study was conducted at EMBRAPA Livestock South, Bagé, Rio Grande do Sul, Brazil, (31°19'51" S, 54°06'25" W and 212 m). Each of three treatments was randomly assigned to three 7-ha paddocks. Treatments were native grassland control (NG), fertilized native grassland (NGF) and natural grassland fertilized and overseeded with annual ryegrass (*Lolium multiflorum*) and red clover (*Trifolium pratense*) (NGFS). Initial seeding in fall 2005 included 8 kg red clover ha^{-1} and 25 kg annual ryegrass ha^{-1}. Fertilized treatments received 50 kg N ha^{-1} as urea in spring (September-December) and 54 kg N and 138 kg P of di-ammonium phosphate in the fall (March-June) of every year. The NGFS paddocks were reseeded with ryegrass in April 2014, and fertilized paddocks received 54 kg N and 138 kg P per ha as di-ammonium phosphate in June 2014. Pastures had been under continuous grazing by yearling Hereford steers with constant intensity of 12 kg forage DM per 100 kg live weight since August 2012. Three "test" animals were in the paddocks for a whole year and grazing intensity was adjusted with other steers. One set of test animals was used in 2013 and a new set entered in July 2014. Measurements were obtained in spring of 2013 (November 5 to 14), fall of 2014 (May 7 to 21) and spring of 2014 (November 4 to 15). Animal coordinates were recorded every 10 min during two days with Garmin™ eTrex® HC series attached to test animals. One observer per paddock recorded animal activity (grazing, rumination and other activities) every 10 min from sunrise to sunset during the same two days. Trajectories and behavior data were processed using the adehabitatLT package (Callenge, 2006) for R (R Core Team 2014). Distance traveled during grazing and proportion of time in each activity were analyzed as a function of treatment, season and their interaction. Treatment and season were analyzed as fixed effects and animal as random effect. It is noteworthy that, prior to statistical analysis, correction to daylight was made of data to different day lengths in order to not interfere with the results.

Results and Discussion

Total forage mass in NG, NGF and NGFS was 2208, 2653 and 2676 kg DM ha^{-1} in spring of 2013, 2712, 3740 and 3024 kg DM ha^{-1} in fall 2014 and 2570, 3130 and 2554 kg DM ha^{-1} in spring 2014. Animals in NG spent more time grazing than in NGF and NGFS (ca. 550 minutes). Grazing time in NGF and NGFS was 63 and 64%, or 490 and 500 minutes. This was probably due to increased time costs of diet selection in NG compared to fertilized treatments. In spring of 2013 animals spent shorter time (62% or 480 minutes) grazing than in fall and spring of 2014 (Table 1). Fertilization probably resulted in easier access to leafy forage, which in turn resulted in shorter grazing time (Gregorini et al., 2009). Thus, better structural characteristics of pasture in the spring of 2013 may have led to shorter grazing by animals at this time, compared to other periods evaluated.

Table 1. Mean and standard error of time spent in grazing, rumination and other activities and daily distance traveled by animals grazing activity in natural grassland (NG), natural grassland improved by fertilization (NGF) and natural grassland improved by fertilization and overseeded of exotic season species (NGFS) and in different periods.

	NG	NGF	NGFS	Spring/13	Fall/14	Spring/14	P_T	P_S	P_{TxS}
Grazing time (%)	70.79a ±1.33	62.72b ±1.50	63.62b ±1.35	62.23a ±1.65	66.95b ±1.74	67.93b ±1.63	0.0340	0.0181	0.4841
Rumination time (%)	17.06 ±1.70	18.68 ±1.73	17.67 ±1.64	18.41 ±1.23	17.39 ±1.30	16.44 ±1.22	0.6735	0.2288	0.2495
Other activities time (%)	12.06 ±3.16	17.67 ±2.91	20.82 ±2.78	19.22 ±2.00	15.44 ±2.05	15.9 ±1.99	0.1412	0.0591	0.1318
Distance (m)	3450 ±255	3322 ±272	3166 ±251	4064a ±215	2036b ±232	3840a ±210	0.4687	<.0001	0.0592

P_T = probability for treatment; P_S = probability for season; P_{TxS} = probability for interaction between treatment and season. Means that are followed by different letters differ ($P < 0.05$) by Tukey test.

Distance traveled while grazing was influenced by season only. Animals walked more during the spring than in fall. This was probably related to the fact that forage mass was highest in fall. Interestingly, time grazing were similar in fall and spring 2014, but distance traveled in fall was just a bit more than half that of spring, which indicates that the grazing speed and pattern of movement were very different in these two seasons. Difference in the size and age of the animals would not be the explanation for this behavior, since the animals had average weight and age of 344 kg and 25 months, 438 kg and 31 months, and 264 kg and 13 months for spring of 2013, fall of 2014 and spring of 2014, respectively.

Conclusions and Implications

Tools such as fertilizing and overseeding of natural grassland reduced the time and presumably the energetic cost of feed acquisition.

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