Using Grasses Morphogenetic Variables for Natural Grassland Grazing Management

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The 22nd International Grassland Congress (Revitalising Grasslands to Sustain Our Communities) took place in Sydney, Australia from September 15 through September 19, 2013.

Proceedings Editors: David L. Michalk, Geoffrey D. Millar, Warwick B. Badgery, and Kim M. Broadfoot

Publisher: New South Wales Department of Primary Industry, Kite St., Orange New South Wales, Australia

Presenter Information

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Keywords: Grazing management, natural pasture, rest intervals, leaf expansion duration.

Introduction

In a perspective of ecologically sustainable agriculture, culturally accepted and economically feasible, natural pastures fits as one of the best options for Southern Brazil region. This study assessed the feasibility of rearing beef heifers from 12 to 18 months of age in natural pasture during its growing season (173 days). We evaluated two rest intervals in a natural pasture managed under rotational grazing. Intervals were defined based on the average thermal sum (degree-days) that fits to leaf expansion duration (average of two leaves) of native species of two grasses functional groups, according to Cruz *et al.* (2010). Only grasses were included in these groups considering their contribution above 65% of forage mass and also their ranking on two functional traits, specific leaf area and leaf dry matter content as reported by the above authors. One group was called *resources' capture functional group*, favoring prostrate species with fast biomass accumulation (*e.g. Axonopus affinis*, *Paspalum notatum*) and the other *resources' conservation group*, favoring tufted species efficient in conserving soil nutrients with higger standing biomass but lower accumulation rate (*e.g. Aristida laevis*, *Saccharum angustifolium*).

The trial aims to incorporate a functional approach into management schedules for increasing grazing efficiency of natural grasslands production without losses in its biodiversity.

Methods

The experimental area of natural grasslands was at Universidade Federal de Santa Maria, at Santa Maria, Central region of Rio Grande do Sul, belonging to the Pampa biome of Brazil, coordinates 29º45'S 53º45'W, 95 m of altitude. Climate was humid subtropical (Koeppen's Cfa), with 19.2°C mean temperature and 1769 mm of annual precipitation. The mean monthly air temperature in summer (December – February) is 24.2°C and in winter (June – August) is 14.5°C with few frosts between May and August and precipitation is fairly well distributed with occasional droughts in summer months. The area consisted of 42 paddocks of 0.5 ha, all of them with water and mineral salt troughs. Treatments were 375 and 750 degree-days (DD) rest intervals in a completely randomized design with two treatments and three replicates. Replicates were sets of six or eight paddocks for treatments 375 DD and 750 DD, respectively. Rest intervals were adjusted according to thermal sum accumulated from mean daily temperatures (MT) calculated by the equation: [MT = [(MxT + MnT)/2], where MxT is the maximum daily temperature and MnT is minimum daily temperature. Basal temperatures were not used in the calculation assuming that during the growing season all MnT were above it. Occupation periods ranged from 3 to 5 days. This management schedule has been used in the experimental area since spring of 2009, one year before the start of this trial. Stocking densities were adjusted by a forage disappearing rate of 4.5% heifers' liveweight on 70 % of green leaf lamina. The experimental period was from 26 September 2010 to 14 April 2011, during the spring-summer growth season of South Brazil natural grasslands. We assessed forage mass, using a double sampling procedure based on BOTANAL package in 0.25 m² quadrats. The cut samples were separated in stem and leaf proportion, green and senescent material attached to plants. At the beginning of each grazing period sward height was registered in the same 20 quadrats evaluated for forage mass. Tester animal were Angus heifers (average of 12 months of age and 176 kg of weight), with four tester heifers used in each paddock-replication, summing 24 animals. Put-and-take heifers of similar age and weight were used to adjust for stocking densities, with a total of 116 animals. As animals' variables stocking density, average daily gain (ADG) and gain/ha were evaluated with weighing after a 12 hours fasting period each 30 days, approximately. All evaluated variables were analysed as repeated measures overtime using ANOVA's F test in SAS software.

Results and Discussion

Results are presented in Table 1. Greater sward height, green forage mass, senescent material attached to plants and forage mass at paddocks first day of grazing were observed in 750 DD. This could be attributed both to larger rest periods and to higher contribution of tufted grasses (resources' conservation group) in forage mass of this

Table 1. Initial forage mass (paddocks first day of grazing IFM); green forage mass (GFM); plants' attached senescent mass (SM); grassland average height; average stocking density (ASD); average daily gain (ADG) and gain per area (GPA) of a natural grassland at South Brazil, during 173 days of evaluation, from 26 September 2010 to 14 April 2011, spring-summer growth season, Santa Maria, Rio Grande do Sul.

Treatments	IFM	GFM	SM	Height	ASD	ADG	GPA
	(kg DM/ha)	(kg DM/ha)	(kg DM/ha)	(cm)	(kg/ha)	(kg/day)	(kg/ha)
375 DD	3259	1536	1723	14	1962	0.28	565
750 DD	4474	1840	2634	18	1979	0.18	283
P	0.0009	<0.0001	<0.0001	0.15	0.908	0.002	0.002
MSE	648.05	300.81	370	3.61	444.98	0.13	42.26

Legends: DD = degree-days; P = probability of type I error for F test; MSE= mean squared error

treatment. In opposite, the higher contribution of prostrate species (resources' capture functional group) in forage mass of 375 DD treatment favoured higher percentage of green material in relation to herbage mass. As observed in another experimental site with similar grassland fisiognomy (Cruz *et al.*, 2010), floristic composition remains the same besides the imposed treatments. Results in Table 1 reflect a change in grassland structure rather than in its diversity.

The highest average daily gain (0.28 kg/animal/day) and gain per area (565 kg/hectare in 173 days) were observed in the treatment 375 DD. Although not so high as other results with similar natural grasslands in South Brazil (Soares *et al.* 2005), this ADG matches required heifers' performance to reach a target weight for first mating at 24 months of age. Average stocking rate was 1970 kg/hectare and the gain per area was much higher than the regional standards of around 70 kg of liveweight/hectare/year (Carvalho *et al.* 2006). The best combination of seasonal variable forage on offer with continuous grazing could produce 250 kg/hectare/year, with average stocking densities of 425 kg/hectare (Carvalho *et al.* 2006, Neves *et al.* 2009).

Conclusions

The shorter rest interval (375 DD) allows to the grassland to reach intended targets of growth for beef heifers' rearing. The grasses' morphogenic traits used as management criteria could increase grazing efficiency of natural grasslands compared to regional standards. We recommend further studies with variable grazing intensities on the same management schedule.

Acknowledgments

We acknowledge CNPq, CAPES and EMBRAPA for research and academic scholarships and research funding. We also recognize the efforts of undergraduate and graduate students that take part of Natural Grasslands Ecology Lab (LEPAN) team whose work make this trial possible.

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