Tillering dynamics in *Brachiaria decumbens* pastures under continuous stocking

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Abstract

Two different strategies for managing *Brachiaria decumbens* under continuous stocking in the State of Minas Gerais, Brazil were evaluated. In one, the pasture was managed to maintain an average height of 15 cm in the winter and 25 cm in both the spring and the summer. In the other, pasture height was kept at an average of 25 cm during all the experiment. All pastures were managed at varying stocking rates with crossbred cattle weighing about 200 kg. A randomized block design and subdivided plots were used. Tiller emergence rate (TER) and tiller mortality rate (TMR) were lower in the winter and higher in the spring and summer. These results indicate a higher *B. decumbens* tiller turnover in the spring and the summer, resulting in more young tillers in the pasture. Lowering the pasture height to 15 cm in the winter increased the TER by 35% compared to 25 cm. On the other hand, the management strategies did not influence the TMR. Hence, to optimize the turnover of tillers in the pasture, *B. decumbens* should be managed, under continuous stocking, to have 15 cm in height in the winter and 25 cm in the spring and summer.

Keywords: *Brachiaria*, grazing, sward height, tiller

Introduction

In Brazil, forage grasses of the genus *Brachiaria* are the most commonly used in the formation of pastures. The species *Brachiaria decumbens* is especially represented in the areas cultivated with pasture used to produce ruminants (Macedo, 2004). The key characteristics that justify the use of such forage are: suitable adaptation to the tropical soil and climate, high competitive capacity and large flexibility in its use and management. Most of the pasture systems in Brazil with *B. decumbens* are managed under continuous cattle grazing. Therefore, understanding the development and perpetuation of this forage managed under continuous stocking is important. For this purpose, the study of tillering dynamics throughout the seasons of the year and in pastures under different defoliation regimes is appropriate (Carvalho *et al.*, 2000). Knowledge on the demographic distribution patterns of *B. decumbens* tillers, in each season of the year, may aid the identification of more rational and efficient management actions regarding the pastures.

Material and methods

From June 2008 to March 2009, two management strategies of a *B. Decumbens* pasture were evaluated at the Departamento de Zootecnia of the Universidade Federal de Viçosa located in the State of Minas Gerais, Brazil. The experimental site was located at 651 m altitude, 20°45' S and 42°51' W. Annual precipitation is approximately 1340 mm and the average relative humidity is 80%. Maximum and minimum temperatures are 22.1 ºC and 15.0 ºC, respectively. The experimental area was made up of eight plots (experimental units) of 0.3 ha. Pastures were managed under continuous stocking and with variable cattle stocking rates. In one management strategy, *B. decumbens* pasture was maintained at 25 cm high during all the trial. In the other, the pasture was kept at an average of 15 cm high during the winter (July to September 2008), and at 25 cm from the beginning of winter until the summer (October 2008 to March 2009). The experiment was carried out using a randomized block design with four repetitions and subdivided plots. Both management strategies for the pasture correspond to the plots. The seasons of the year are the subplots. In each experimental unit, three 0.0625 m² areas representing the mean initial condition of the pasture were delimitated with a 25 cm square shape metal frame painted in white. At the start of the evaluation, all tillers inside the frames were counted and marked with coloured plastic coated wire. Every 30 days, all tillers were recounted and new tillers were marked with a different wire colour. The collected data was used to calculate the tiller emergence rate and the tiller mortality rate, according to Carvalho *et al.* (2000). Data were analysed by variance analysis as repeated measures. Management strategies, season of the year and their interaction were fixed effect and blocks were considered random effects. Data regarding the management strategies of the pasture were compared using the F-test, while the ones regarding the seasons of the year the Tukey's test (10%).

Results and discussion

The tiller emergence rate (TER) tended to be lower ($P<0.10$) in the winter than in the spring and summer (Table 1). The lower TER in the winter was due to the climatic conditions which were unfavourable to *B. decumbens* growth in this season which was characterized by lower temperatures, precipitation and sunshine duration. On the other hand, in the spring and summer, when the climatic conditions were favourable to the development of the pasture, the TER was higher ($P<0.10$). In comparison with the pastures managed to have 25 cm height, the lowering of the pasture to 15 cm in the winter increased the TER by 35% (Table 1). Lower pastures in the winter showed better turnover conditions during the winter itself and also in the following seasons (spring and summer). For lower canopies, the higher light incidence at the base of the plants stimulates tillering (Sackville Hamilton *et al.*, 1995), especially when the environmental conditions are favourable to the plant development, beginning in the spring. The tiller mortality rate (TMR) also tended to be influenced ($P<0.10$) by season of the year. Differing values from the spring, through summer and winter were observed. However, there was no effect of management strategies of the pasture on the TMR were not observed ($P>0.10$) (Table 1). The lower TMR in the winter may be an ecological strategy of *B. decumbens* to save nutrients since the absorption of nutrients by the plant, via mass flux and/or diffusion, is interfered with by the water deficit in the winter (Novaes and Smyth, 1999). Notwithstanding, the higher TMR in the spring coincides with the higher TER in this season, which indicates higher tiller turnover in the *B. decumbens* pasture in the spring. In the following season (summer), the TMR decreased, but the TER was still high, showing that the tiller turnover, which started in the spring, persisted in the summer. This pattern demonstrates that old tillers have little relative participation in *B. decumbens* pastures. In addition, the lowering to 15 cm high of *B. decumbens* pasture in the winter did not compromise the balance between the emergence and mortality of tiller, which was positive. Thus, management practices of the pasture should be optimized to allow the expression of the natural pattern of tiller turnover of *B. decumbens* under continuous stocking starting in the spring.

Table 1. Emergence and mortality rates (%) of the basal tiller of *Brachiaria decumbens* pastures managed under continuous stocking and fixed (25 cm) or variable (15-25 cm) height during the seasons of the year.

Pasture height (cm)	Seasons of the year			Mean
	Winter	Spring	Summer	
	Basal tiller emergence rate (%)			
25	3.0	35.9	37.3	25.4 [b]
15-25	6.5	51.0	45.3	34.2 [a]
Mean	4.7 [b]	43.5 [a]	41.3 [a]	
	Basal tiller mortality rate (%)			
25	3.4	21.6	17.3	14.1 [a]
15-25	6.1	20.7	12.8	13.2 [a]
Mean	4.7 [c]	21.2 [a]	15.1 [b]	

For each characteristic, means followed by the same letter in lowercase in the same line or in uppercase in the same column do not differ ($P>0.10$).

Conclusion

The renewal of *B. decumbens* tillers is low in the winter and intense in the spring and summer. The management of the *B. decumbens* pasture under continuous stocking should be seasonal, keeping the forage grasses at 15 cm high in the winter and 25 cm in the spring and summer in order to optimize the turnover in the spring.

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Selective grazing, patch stability and vegetation dynamics in a rotationally-grazed pasture

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Abstract

The lack of data on interactions between grazing intensity and livestock species makes it difficult to propose recommendations for the management of biodiversity and production in grassland ecosystems. A productive grassland area was therefore divided into 12 plots that were rotationally grazed by heifers at a high or a low stocking rate or by ewes at the same low stocking rate. Stocking rate appeared more important than grazer species in affecting the initial direction of community changes. Both heifers and ewes preferentially selected for bites containing legumes and forbs, and avoided reproductive grass. In lightly grazed plots, no significant effect of grazer species on sward botanical composition could be detected after four years of treatment application, though legumes were on average three–fold more abundant in plots grazed by heifers than plots grazed by ewes. Selective grazing on legumes and forbs, and avoidance of reproductive grass, can partly explain the stability of fine-scale grazing patterns in plots that were used by heifers. Cattle grazing would thus favour the creation of relatively stable open patches enabling prostrate forbs and legumes to compete with tall grasses. This could result in divergent vegetation dynamics within plots.

Keywords: Diet selection, Boolean model, stocking rate, cattle, sheep

Introduction

The 'Environment Research Observatory' experiment on Agro-ecosystems, Biodiversity and Biogeochemical Cycles investigates the effects of grazing intensity and herbivore grazer species on plant functional group diversity in pastures evolving from the same initial biodiversity level, and the consequences on productivity and carbon sequestration. The experiment was set up on a grassland that had historically been submitted to intensive management schemes. Starting in 2005, established plots were used under a rotational grazing system and were either grazed by cattle at a high or a low stocking rate or by sheep at the same low stocking rate. Though dynamic equilibrium of soil-vegetation-herbivore interactions has not yet been reached, certain factors affecting the rate and direction of community change can bring about rapid responses in vegetation dynamics. Differences in selectivity between sheep and cattle can have a clear impact on vegetation dynamics (Grant *et al.*, 1996; Warren *et al.*, 2002), whereas under other conditions the difference in impact between the two species was minor compared with that of grazing intensity (Stewart and Pullin, 2008). This lack of data on interactions between livestock species and grazing intensity prompted us to assess vegetation composition response to three management regimes applied to the grassland plots.

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