Morphophysiological adaptations of *Brachiaria humidicola* cultivars under grazing

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Introduction

Pastures of *Brachiaria humidicola* are broadly used in Brazil, especially in soils with low fertility and poor drainage (Valle et al. 2010). Currently, 3 cultivars are commercially available: Tully, Llanero and BRS Tupi (available since 2012). Despite the extensive use of this species, research has focused primarily on aspects related to herbage and animal production, while only a few studies aimed at understanding morphological adaptations of the plants when subjected to grazing and contrasting environmental conditions. Therefore, the aim of this work was to evaluate some morphological traits of 2 *B. humidicola* cultivars when continuously stocked during 2 seasons of the year.

Methods

The experiment was carried out at the EMBRAPA National Beef Cattle Research Center, in Campo Grande, MS, Brazil (20°27' S, 54°37' W; 530 m asl), from January to December 2012. The climate, according to the Köppen-Geiger classification, is rainy (tropical savanna), subtype Aw. The soil of the experimental area is classified as an Oxisol (red clayed latosol), with poor drainage and subject to temporary flooding. Pastures of 2 *Brachiaria humidicola* cultivars (BRS Tupi and Tully) were established in early 2004 and, since 2010, were fertilized annually with 30 kg P_2O_5/ha, 30 kg K_2O/ha and 50 kg N/ha. The experimental area comprised 9 ha, divided into 6 paddocks of 1.5 ha. Nelore steers were used with an average live weight of 220 kg. Treatments consisted of the 2 cultivars assigned in a complete randomized block design with 3 replications. The area was continuously stocked with stocking rate adjusted in order to maintain a relatively constant sward height of 20 cm throughout the year. Sward height was monitored weekly at 30 points per experimental unit using a sward stick (Barthram 1985). Morphogenetic and structural traits were assessed on 15 marked tillers per experimental unit. The following variables were measured: phyllochron, leaf lamina length and leaf lifespan. At the end of each cycle of data collection (on average 4 weeks), new tillers were marked. Data were grouped by season of the year (dry and rainy seasons) and analyzed by a mathematical model, where cultivars and seasons were considered fixed effects and the interactions between them and blocks as random effects. All statistical analyses were performed by the method of least squares using the General Linear Model of SAS (SAS Institute 1996). Means were compared using a significance level of 5%.

Results and Discussion

Canopy heights remained relatively constant throughout the year and within the targets, for both cultivars. During the dry season, average sward heights were 18.2 ± 2.4 cm and 17.6 ± 2.8 cm for Tully and BRS Tupi, respectively; during the rainy season, the values were 20.1 ± 1.9 cm for Tully and 21.9 ± 1.4 cm for BRS Tupi. The number of green leaves per tiller (NGL) (5.2 leaves/tiller) was not affected by season of the year, but Tully had more green leaves than BRS Tupi (5.6 vs 4.7 leaves/tiller). The NGL seems to be a genotypic constant (Lemaire and Chapman 1996) and may vary between species and even among cultivars. This characteristic is related to leaf lifespan (LLS) expressed by the number of intervals of leaf appearance. Thus, the greater NGL for Tully can be attributed to the higher LLS, mainly during

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the dry season (Table 1). Moreover, LLS was constant for BRS Tupi between seasons, apparently an adaptation to produce the same amount of leaves in a given time. According to Robson (1969), there are several strategies for producing the same quantity of leaves, including variations in rates of appearance and elongation of leaves and duration of the elongation period. The phyllochron showed the same pattern as LLS, i.e., phyllochron values for BRS Tupi were constant between seasons, while Tully displayed higher values for phyllochron during the dry period (Table 1). The values for phyllochron for BRS Tupi and Tully were similar during the rainy season but Tully had lower values than BRS Tupi during the dry period.

Table 1. Leaf lifespan, phyllochron and final lamina leaf length for 2 *Brachiaria humidicola* cultivars continuously grazed in 2 seasons of the year.

Season of the year	Leaf lifespan (days)		Phyllochron (days/leaf)		Leaf lamina length (cm)	
	Cultivars					
	BRS Tupi	Tully	BRS Tupi	Tully	BRS Tupi	Tully
Dry	123.7Ab[1] (± 19.30)[2]	220.5 Aa (± 19.42)	24.2Ab (± 2.88)	35.2 Aa (± 2.89)	8.60 Ba (± 0.52)	7.3 Aa (± 0.52)
Rainy	109.6 Aa (± 16.85)	113.8 Ba (± 19.42)	24.1 Aa (± 2.51)	20.4 Ba (± 2.89)	12.9 Aa (± 0.45)	8.6 Ab (± 0.45)

[1]Means within columns followed by the same upper-case letters or in rows followed by the same lower-case letters do not differ (P>0.05). [2]Values in parenthesis correspond to standard error of the mean.

Another interesting result concerned the final leaf lamina length (FLL). For Tully, FLL reduced only slightly from wet to dry season, while for BRS Tupi the reduction was around 35%. This pattern indicates that the cultivars present different strategies to adapt to changes in the environment. BRS Tupi seems much more effective at using available resources to expand leaves rapidly when growing under non-limiting conditions, while Tully seems to have a more conservative strategy, being able to tolerate a more limiting environment. In this way, it seems that BRS Tupi could adapt better to fertile or flooded soils with no extreme dry period, while Tully could tolerate infertile soils and a more prolonged drought period.

Conclusion

Different cultivars of *Brachiaria humidicola* present different patterns of adaptation to the environment. Since BRS Tupi is more effective at using available resources to grow faster in non-limiting conditions and Tully is more tolerant of poor soil fertility and prolonged drought periods, farmers can choose the appropriate cultivar for their particular circumstances.

References

Barthram GT. 1985. Experimental techniques: The HFRO sward stick. In: Biennial Report 1984/1985, The Hill Farming Research Organisation, Penicuik, Scotland, UK. p. 29−30.

Lemaire G; Chapman D. 1996. Tissue flows in grazed plant communities. In: Hodgson J, Illius AW, eds. The ecology and management of grazing systems. CAB International, Wallingford, UK. p. 3−36.

Robson MJ. 1969. Light, temperature and growth of grasses. In: Annual Report 1969, The Grassland Research Institute, Hurley, UK. p. 111−123.

SAS Institute. 1996. SAS/STAT user's guide: statistics. Version 6. 4th Edn. SAS Institute, Cary, NC, USA.

Valle CB; Macedo MCM; Euclides VPB; Jank L; Resende RMS. 2010. Gênero *Brachiaria*. In: Fonseca DM; Martuscello JA, eds. Plantas forrageiras. Universidade Federal de Viçosa, Viçosa, MG, Brazil. p. 30−77.

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