Evaluation of new dwarf elephant grass genotypes for grazing

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Abstract. Elephant grass stands out for its production potential, forage quality and acceptance by animals. However, its tall size makes management under grazing difficult and dwarf cultivars have been selected and evaluated to overcome this limitation. The objective was to characterize agronomic aspects of dwarf elephant grass genotypes submitted to two defoliation intensities. The experiment was installed in a 5 x 2 factorial scheme, with five elephant grass genotypes (2022, 1810, 2111, 2035, BRS Kurumi) and two residue heights after defoliation (25 and 45 cm). A randomized block design with three replications in 4x3m plots was used. Forage above the residue height was cut whenever the canopy reached 93-95% light interception. Residue heights did not influence leaf/stem ratio, basal and total tillering, and dry matter production. On the other hand, influence of residue height on canopy height, aerial tillering and forage accumulation rate was observed. The forage accumulation rate increased by 19% for the 45 cm residue compared to the 25 cm residue. No interaction was observed between genotype and residue height for the variables canopy height, leaf:stem ratio, basal tillering, aerial tillering, forage mass and forage accumulation rate. In relation to tillering, BRS kurumi showed greater total and aerial tiller number, 31% higher than the average of the other materials. Although the cultivar BRS kurumi has more vigorous tillering, the variables leaf:stem ratio and forage accumulation rate were higher in the new materials, especially material 1810, which presented better performance compared to the control. In view of this, it is concluded that the new grass genotypes have a higher proportion of leaves and forage accumulation rate than BRS Kurumi, and that the residue height of 45 cm provides a higher forage accumulation rate.

Introduction

The species *Cenchrus purpureus* stands out as a forage resource because it has cultivars with high forage production, superior nutritional quality and good acceptance by animals (Silva et al. 2021). Although the species has great potential for grazing, for many years attempts to graze its cultivars were frustrated, due to the large size of the plants, which made it difficult for animals to harvest, leading to the need for frequent mowing (Gomide et al; 2015). With the launch of the BRS Kurumi cultivar, this obstacle to the use of this species under grazing was overcome, however, there are still few sized varieties for grazing, which makes the evaluation of new sized materials for grazing of fundamental importance (Pereira et al. . 2017).

For the launch of a new cultivar, it is essential to establish its proper management, which includes adequate defoliation intensity as well as the ideal height of the canopy at the beginning of grazing (Tesk et al., 2020). It is also necessary to know the growth dynamics of the genotype, to promote greater use of its nutritional value and avoid errors that could lead to pasture degradation or underutilization of the genetic potential of the cultivar.

The objective was to characterize structural and agronomic aspects of elephant grass genotypes selected for use under grazing (dwarf size) subjected to two intensities of defoliation.

Methods

The experiment was carried out at the José Henrique Bruschi Experimental Field, of Embrapa Gado de Leite, located in Coronel Pacheco-MG, (21º33’22’’ south latitude, 43º06’15’’ west longitude and 410 m altitude). The soil of the experimental areas is classified as a dystrophic Red-Yellow Latosol, with a clayey texture (Santos et al. 2018). The assay was performed in a 5 x 2 factorial scheme, with five elephant grass genotypes (2022,1810, 2111, 2035, BRS Kurumi) and two stubble heights (25 and 45 cm) in a randomized block design with three replications, in 4x3m plots. The forage mass harvest frequency was based on the light interception (LI) range of 93-95% across the canopy. The experimental period comprised the rainy season between December 2021 and April 2022. The monitoring of light interception (LI) by the canopy was performed weekly with the LP80 canopy analyzer (Accupar), at four points per experimental unit.

The harvest of forage samples in the plots was carried out inside metallic frames measuring 1.0 x 0.5 m. After harvesting, the remainder of the plot was lowered to the respective predetermined heights, using a costal brush cutter. After each Harvest, the plots received topdressing fertilization, using the formulation 20-05-20 (N-P-K), with the equivalent of 50 kg/ha of N and K2O.

The canopy height measurements were taken, at the time of forage harvest, at five points per experimental unit, using a ruler graduated in centimeters. The forage harvested in each experimental unit was separated into leaf lamina, stem and dead forage fractions, being then oven dried and weighed. The cut interval was recorded to estimate the period, in days, between harvests. Tiller production was measured in one clump per plot and separated into aerial and basal tillers. With the data described, the following variables were estimated: mean canopy height, harvested forage mass, forage morphological composition, leaf:stem ratio, mean interval between cuts and forage accumulation rate.

The data were submitted to analysis of variance performed by the R software in a mixed model, considering the genotypes, the residue heights and their interactions as fixed effects, and the block and the experimental error as random effects. Treatment means were compared by Tukey (genotype) or Fisher (stubble height) test at 5% probability.

Results and Discussion

There was no interaction between genotype and stubble height for the variables canopy height, leaf:stem ratio (LSR), number of basal and aerial tillers, harvested forage mass and forage accumulation rate (FAR) (Table 1). There was no difference between the genotypes for the variables canopy height, number of basal tillers and forage mass when compared to the cultivar BRS Kurumi. However, for the variables leaf:stem ratio and forage accumulation rate, genotype 1810 showed better performance compared to BRS Kurumi. The higher leaf:stem ratio of BRS Kurumi in relation to other genotypes was one of the outstanding variables when evaluating and selecting it for release (Gomide et al.; 2015).

In relation to the number of tillers per tussock, BRS kurumi presented total and aerial tillering 31% higher than the average of the other materials. Basal tillering is an important feature for forage grasses intended for grazing (Sollenberger et al., 1989) as it guarantees the replacement of decapitated tillers and, consequently, rapid regrowth and pasture perenniality. Although these genotypes have a lower tillering potential, this characteristic did not affect the rate of forage accumulation and dry matter production per hectare. Additionally, the new materials present a leaf:stem ratio equal to or higher than the BRS Kurumi, demonstrating that although there is a lower tillering, it is compensated by the higher proportion of leaves.

Table 1. Canopy height, leaf:stem ratio (LSR), basal, aerial and total tiller number per tussock, forage mass (FM) and forage accumulation rate (FAR) according to the elefantgrass genotypes.

Genotyopes	Canopy Height (cm)	LSR	Basal Tiller	Aerial Tiller	Total Tiller	FM (kg DM/ha)	FAR (kg DM/ha.day)
1810	89,83[a]	9a	11a	34b	44b	3041[a]	115a
2022	86,83[a]	8ab	13a	26b	38b	2588[a]	86b
2035	93,66[a]	6abc	12a	35b	46ab	2971[a]	114a
2111	97[a]	6 bc	10a	32b	42b	2807[a]	104ab
Kurumi	87,5[a]	4c	7a	55a	62[a]	2634[a]	103ab

Means followed by the same letter do not differ statistically by Tukey's test at 5% probability

The stubble heights did not influence the leaf:stem ratio (LSR), basal and total tiller number, and forage mass (Table 2). Meantime, the stubble heights influence the canopy height, number of aerial tiller and forage accumulation rate. The forage accumulation rate increased by 19% for the 45 cm stubble hright compared to the 25 cm. The aerial tillering also showed a similar response with an increase of 20% for residue of 45cm, demonstrating that the higher residue stimulates greater aerial tillering. Canopy height when reaching a light interception of 95% is also influenced by the level of defoliation, and it was observed that plants subjected to more intense defoliation (25 cm) reached 95% of light interception with 82 cm, while under the stubble height of 45 cm this condition was reached with a canopy height of 100 cm (Table 2).

Table 2. Effect of the stubble height on canopy height, leaf:stem ratio (LSR), basal, aerial and total tiller number per tussock, forage mass (MF) and forage accumulation rate (FAR) of elephant grass genotypes.

Stubble Height	Canopy Height (cm)	LSR	Basal Tiller	Aerial Tiller	Total Tiller	FM (DM/ha)	FAR (kg DM/ha.day)
25 cm	82b	6,4a	11,6a	32b	44[a]	2619a	93b
45 cm	100a	6,7a	9,7a	40a	49a	2999a	116a

Means followed by the same letter do not differ statistically by test F at 5% probability

There was a significant interaction between genotypes and stubble heights for the variables cut interval and percentage of leaves on the harvest forage mass (Table 3). The cut interval was greater under the residue of 25 cm for the 2022 genotype with a period of 39 days, demonstrating that for this genotype a residue of 45 cm is recommended to optimize the regrowth capacity. For the other genotypes, no difference was observed between the stubble heights.

Also, the percentage of leaves in the harvested forage was lower under the residue of 25 cm in contrast to the 45 cm residue only for the 2022 genotype, reducing from 86 to 79%, respectively. Under the lowest stubble heght, the 2022 genotype had a lower percentage of leaves. The other genotypes did not differ from each other in terms of the percentage of leaves and did not vary with the evaluated stubble heights (Table 3).

Table 3. Cut interval and percentage of leaf in the forage mass according to elephantgrass genotypes and stubble height interaction.

	------------ Stubble Height ------------			
Genotypes	25 cm	45 cm	25 cm	45 cm
	Cut Interval (days)		Leaf percentage (%)	
2022	39bA	27aA	79bB	86aA
1810	27aA	26bB	85abA	87aA
2035	27aA	27aA	86aA	81abA
2111	27aA	27aA	86aA	87aA
Kurumi	27aA	27aA	81abA	86aA

Means followed by the same letter, lowercase in the column, and uppercase in the row, do not differ statistically by Tukey's test at 5% probability.

Conclusions and/or Implications

The elephant grass genotypes from crosses of the genetic improvement program of Embrapa Gado de Leite have a higher leaf-stem ratio and forage accumulation rate when compared to BRS Kurumi. The residue height influences plant height, aerial tiller number and forage accumulation rate, being recommended for greater optimization of forage production the residue of 45 cm. The 2022 genotype has a lower rate of accumulation in relation to the others and a longer interval between cuts when submitted to a lower residue height (25 cm).

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