Yield and morphological potential of sorghum biomass hybrid BRS 716 at different stages of development for silage production

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Introduction In regions with seasonality of forage production and narrow planting amplitude of maize, sorghum cultivation is an interesting alternative for silage production, as it has the advantage of having greater drought tolerance and a greater planting window than maize. Sorghum cultivars are classified into five groups: grain sorghum, forage sorghum, sweet sorghum, biomass sorghum and broomcorn according to the purpose of use (Embrapa, 2015). In 2014, Embrapa released the sorghum biomass hybrid BRS 716 for bioenergy generation, but due to its high productivity, cattle raisers are interested in its use for silage production. However, studies on its morphological characterization and agronomic potential to define the best stage of development for harvesting and ensiling are still limited. The objective of this study was to evaluate agronomic characteristics of the sorghum biomass hybrid BRS 716 at different stages of development for silage production.

Material and Methods The experiment was carried out at the Embrapa Agrossilvipastoril Research Center. Chemical-bromatological analyzes were performed at the Animal Nutrition and Forage Cultivation Laboratory of the Federal University of Mato Grosso, campus Sinop-MT. A randomized block design with three replications was used. The treatments corresponded to three different stages of development of biomass sorghum hybrid BRS 716 (vegetative, boot stage and milky/soft dough). The vegetative stage was defined as the pre-emission of the flag leaf, while the boot stage, when panicle emission began, and the milky/soft dough stage, when the grain of the lower half of the panicle were milky and those of the upper half in the soft dough stage. Sorghum was sown on November 16, 2018. The row spacing was 0.70 m, with a sowing density of 130,000 plants.ha^{-1}. The experimental plot consisted of two rows 5.0 m in length, totaling an area of 7 m². Harvest was performed 112, 139 and 161 days after planting for vegetative, boot stage and milky/soft dough stages, respectively. For plant height, the average height of the plants, at the moment of harvest, in each stage, of three representative plants were selected per plot. At the vegetative stage the height was measured by the distance from the ground level to the apical meristem insertion point. In the boot stage, the height was measured from soil level to the ligule of flag leaf. For the milky/soft dough stage, height was considered as the distance from the soil surface to the apex of the panicle. Ten representative plants per plot cut at 0.2 m from soil level to obtain the agronomic characteristics. With the cut plants, the green mass was weighed and subsequent selection of three plants for morphological separation (leaf blade, sheath stem, panicle

and dead material). After separation, each fraction was weighed and the samples were placed in a forced ventilation oven at 55ºC until reaching a constant weight. The pre-dried material was weighed and ground in a Willey type mill with 1.0 mm mesh sieve. After grinding, the material was dried in an oven at 105º C for 16 h. Data were subjected to analysis of variance and means compared by the Tukey test ($P < 0.05$).

Results and discussion For the variables height, yield, leaf proportion, panicle and dead material, a significant effect of the sorghum developmental stage was observed (Table 1). In the vegetative stage, a lower value of plant height, dry matter yield (DM), panicle and dead material proportion, and a higher leaf proportion was observed, while in the milky/soft dough stage, the highest height and DM yield were observed (Table 1). The higher plant height and DM productivity of the plant is due to the longer development time that the plant had until reaching this stage for this photosensitive hybrid. Compared to forage sorghum, which has a productivity of 15 to 20 t ha $^{-1}$ DM (Embrapa, 2015) and maize, with an average yield of 17 t ha^{-1} DM (Embrapa, 2011), sorghum productivity of this hybrid stands out in this context, with minimum yield of 27.79 t ha^{-1}. As age increases in sorghum cultivation, there is stem elongation and panicle development, as well as senescence of older leaves, which justifies the lower proportion of leaf and the higher proportion of panicle and dead material for the boot and milky/soft dough stages (Embrapa, 2015). Thus, it can be observed that the yield of biomass sorghum BRS 716 increases with the development of the plant, however, studies evaluating the fermentative characteristics and the nutritional value are necessary to determine best development stage for harvest of this cultivar for ensiling.

Table 1 Agronomic characteristics of sorghum biomass cv. BRS 716 at different stages of development. Sinop-Brazil. 2019

Stages	height (m)	Productivity (t ha^{-1} DM)	Leaf	Stalk	Panícle	Dead
			(%)			
Vegetative	3,66c	27,79c	31,85a	68,15a	0,00b	0,00b
Boot stage	4,87b	31,51b	13,95b	77,29a	4,58a	4,18a
Milky/soft dough	5,18a	43,51a	10,68b	79,50a	6,74a	3,08ab
CV	1,55	3,74	25,04	7,61	32,24	52,29

CV: Coefficient of variation. Means followed by the same letter do not differ from each other by the 5% Tukey test.

Conclusion BRS 716 biomass sorghum has higher DM productivity in the milky/soft dough stage.

References

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