Losses and fermentative profile of sorghum biomass hybrid BRS 716 silage in different stages of plant development

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Introduction Sorghum is an interesting alternative for silage production, as it has the advantage of having greater drought tolerance, greater sowing amplitude than maize and a nutritive value of 85 to 95% compared to maize silage. Among the types of sorghum, there is biomass sorghum, characterized by its rapid growth and productive potential. Sorghum biomass cv. BRS 716 is a hybrid released by Embrapa in 2014 for energy cogeneration by burning dry biomass and producing second generation ethanol. Few studies have been conducted to evaluate biomass sorghum for silage production. The objective of this study was to evaluate the fermentative characteristics of the feedstock sorghum biomass cv. BRS 716 ensiled at different stages of plant development to determine the most suitable stage for ensiling.

Material and Methods The experiment was carried out at Embrapa Agrossilvipastoril during the 2018/19 crop season, and chemical-bromatological analyzes were performed at the Animal Nutrition and Forage Cultivation Laboratory of the Federal University of Mato Grosso, Sinop-MT campus. A completely randomized design with six replications was used. The treatments corresponded to three different stages of development of sorghum biomass cv. BRS 716 (vegetative, boot stage and milky/soft dough). The vegetative stage was defined as the pre-emission period of the flag leaf, the boot stage, was just prior to panicle emission, and the milky/soft dough stage, when the grains of the lower half of the panicle were milky and those of the top half in the soft dough stage. The cut was made at 20 cm from the soil surface, when the plants reached the treatment stage. The collected material was processed with the aid of a stationary chopper, with particle size ranging from one to two cm. After this process, mini silos (2.75L) were filled with a density of 600 kg m³. The silos remained closed for a minimum of 90 days and were opened in August 2019. The silos were weighed after closing and opening. At the moment the mini silos were opened, samples were collected at the geometric center of the experimental silo. An aqueous extract was made on each sample, according to Kung Jr. (1996), with dilution of 50 g of sample to 200 ml of distilled water, for pH measurement, and determination of ammonia N content, according to Fenner (1965). Gas and effluent losses were quantified according to the methodology described by Jobim et al. (2007). After tabulation, the data obtained were subjected to analysis of variance and the means compared by the LSD test ($P < 0.05$).

Results and discussion For the N-ammoniacal variables, gas loss and effluent loss, there was an effect of treatments, while for pH no effect of sorghum stages was observed (Table 1). All treatments presented pH values within the range considered ideal for well-preserved forages (pH ≤ 4.2), which indicates adequate fermentation in the ensiling of these materials (Table 1). In relation to the N-ammoniacal, all treatments presented values within the maximum value acceptable for good quality silage (McDonald et al., 1991). The vegetative stage presented the highest content, demonstrating a lower quality of silage. Gas losses, were greater at the milky/soft dough stage indicating the highest loss value, which is associated with undesirable fermentations inside the silo, with CO_2 production, while the vegetative stage presented the highest effluent loss, due to the lower dry matter (DM) content compared to the others (Table 1). According to McDonald et al., 1991, fodder with less than 30% DM can produce effluents.

Table1: Chemical-bromatological analysis of losses and fermentative profile of sorghum biomass cv. BRS 716. Sinop-Brazil, 2019

Stage	**pH**	**N-ammoniacal (% NT)**	**Gas loss (% MS)**	**Effluent loss (% MN)**
Vegetative	3,83	4,97b	3,17b	5,86a
Boot stage	3,77	4,95b	3,02b	4,12b
Milky/soft dough	3,76	8,56[a]	8,35[a]	2,77c
CV	2,01	14,09	21,98	14,68

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

Conclusion Sorghum biomass cv. BRS 716 at the boot stage presents better fermentative characteristics for silage production

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