Evaluation of different dry matter levels on sorghum silage quality

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Introduction The determination of the ideal harvest time is a critical point to obtain silages with high nutritional value and adequate dry matter content to improve the fermentation process. Paiva (1976) recommends levels of 30-35% DM in the forage to be ensiled. According to McDonald et al. (1991), forage dry matter should be higher than 25% to avoid considerable effluent losses. On the other hand, contents above 37% of DM present high fiber with low quality, impairing on compaction and favoring undesirable fermentations that reduce the silage quality. In this way, the forage dry matter has a key role in silage fermentation process. Aiming to evaluate the effect of different forage dry matter levels on silage production and quality this study was carried out.

Materials and methods The experiment was carried at the Núcleo de Pesquisa e Extensão da Cadeia Leiteira (NUPECLE) located at the Universidade Federal de Santa Maria. The sorghum (Advanta® ADV 2499) was sown in January 2015. The ensiling process was carried out according to forage dry matter (25%, 30%, 35% and 40%) previously determined in a forced air oven. The silos were elaborated in April, May and June, 2015, with three replications per treatment. The plants were harvested and then chopped at an average particle size of 2 cm, and then 12 mini-silos weighing 10 kg each one were produced. The filling, compressing and sealing of the mini-silos were performed in 10-L plastic buckets that were internally coated with plastic bags. The silos opening was performed after 60 days of storage. Buffering capacity of the mass ensiled was determined according to McDonald's (1991). The production and contribution of sorghum morphological components was estimated by manual separation of two whole plants, components were dried in a forced oven at 55ºC for at least 72h, until constant weight. The pH measurements were obtained according to Silva and Queiroz (2002). The dry matter recovery (RMS), losses through gases (LG) and effluents (LE) were estimated according to Jobim et al. (2007). The data were subjected to regression analysis on statistical package SAS, version 9.2 (SAS, 2008).

Results and discussion The morphological components of sorghum presented quadratic effect ($P<0.05$) when expressed in function of dry matter levels (Figure 1). There is a clear inversion of the participation of the stem in relation to the panicle. When the DM content is low, below 30%, the amount of stem is high and panicles participation is reduced. This may result in silages with low nutritional quality, high fiber content and low starch participation. From 30% DM, there is an increase in panicles participation (maximum production with 35% DM), consequently higher grains participation, and reduction of stems, which implies in silages with better nutritional quality. Stem is the major responsible for the production of low nutritive value silages due to its low nutritional quality, while the presence of grains and/or panicles in the ensiled forage implies on silages with good nutritive value and appropriate fermentative process (Flaresso et al., 2002).

According to Pedreira et al. (2003), the panicle dry matter and its participation in the whole plant are related to the dry matter contents of the hybrid at the harvest time. The maximum forage production (17,208 kg/ha DM), described by the equation ($y = -620.91+4667.99DM-68.99DM^2$) was obtained with 34% DM. Evaluating different sorghum hybrids, Skonieski et al. (2010) observed values of 17,527 kg/ha DM. A quadratic effect on sorghum silage density ($y = +1658.68+0.77DM-0.55DM^2$) was observed. That does denote that the increase in DM level causes a decrease in density, probably due to difficulty in silage compaction. The maximum dry matter recovery (100%), described by the equation: $y = -496.62 + 41.19DM-0.71DM^2$ was obtained when the sorghum presented 29% DM, although this variable is influenced by several factors, not only DM level. Effluent and gas losses, pH and silage buffering power did not adjust to the regression equation. This indicates that these variables are not affected by the increase of forage dry matter.

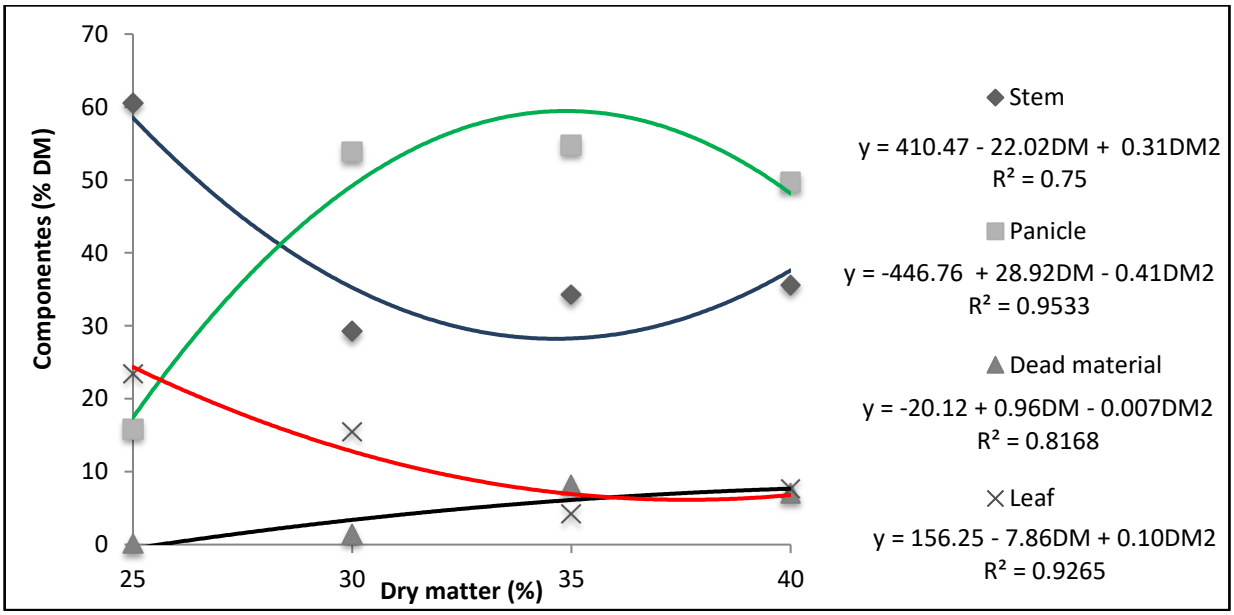

Figure 1 Participation of sorghum morphological components as a function of DM level at the harvest time.

Conclusions In sorghum crop, the DM values of 34% should be used as an indicator to obtain high quality silages.

References

Skonieski F.R. et al. Produção, caracterização nutricional e fermentativa de silagens de sorgo forrageiro e sorgo duplo propósito. 2010. Act Scientiarum. Animal Science, 32:27-32.