Effect of associated additives in pH and NDF content in sugarcane (*Saccharum officinarum*) silages

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Introduction An alternative to the seasonality of forage production in the grazing-lands is the maintenance of feed supplies such as silages (Carvalho et al., 2007). Sugarcane stands out, mainly, for the high yield per hectare. However, with restrictions to the use in cattle production systems, as the daily need of cutting, the low digestibility of fiber and protein and mineral contents. Sugarcane ensiling can solve, or even reduce the annual forage surplus and the losses by fire or frost, and has been utilized in cattle rations due to these logistic and operational benefits. The fermentative losses of sugarcane silage can turn its utilization impracticable. The predominance of alcoholic fermentations in those silages demands additives to improve the aerobic stability and reduce dry matter losses. The additives act upon the fermentation of silage, alter the ensiled mass and inhibit the development of undesirable microorganisms in the fermentation process (Santos, 2007). In spite of the great volume of studies in the latest years, the use of additives in sugarcane ensiling, whether be bacterial, chemical or organic still represents discrepant results. In this sense, the objectives of this work were to evaluate the effect of associations of additives on pH and on the neutral detergent fiber contents in sugarcane silages.

Material and Methods The experiment was conducted at the Federal Institute of Minas Gerais in Bambui-MG. The ensiled sugarcane was the variety SP 1049. The cutting and harvest were performed in September 2010 after 12 months of planting (one-year old sugarcane) at 8 cm from soil, followed by defoliation and grinding. Both *Arachis pintoi* and *Leucaena leucocephala* (organic additives) in the sugarcane were ground in a conventional chopper of forages with average particle size from 2 to 3 cm, packed in plastic bags and used at ensiling in artificial silos with the sugarcane. The pH and NDF analyses were performed in the Animal Nutrition Laboratory of the Agricultural Science Department (DCA/IFMG/BAMBUÍ). The experimental design was a completely randomized with five treatments and four replications. The treatments were: sugarcane ensiled with the biological additive *Lactobacillus plantarum* 2.5 x 10^{10} CFU/g; additive *L. plantarum* associated with 1% CaO, additive *L. plantarum* associated with 1% Urea, additive *L. plantarum* associated with 15% of *L. leucocephala* and additive *L. plantarum* associated with 15% of *A. pintoi* Belmonte cultivar, in percent mixtures of fresh basis. The variance analysis was performed in the statistical package SAS (1996) and the means compared by the Tukey test ($P<0.05$).

Results and Discussion There was an effect ($P<0.05$) among treatments in relation to pH and the associations of additives in sugarcane silages presented differences. Sugarcane silage treated with *L. plantarum* associated with 15% *A. Pintoi* presented pH similar to that of the control silage. The sugarcane ensiled with *L. plantarum* associated with *Leucaena* or with urea or CaO were similar and less acidic among the tested silages. Amaral et al. (2009), treated sugarcane silage with 1% CaO, and found increases of up to 5 units in pH, lower than those found in this work. Santos et al. (2008) reported pH values between 8.7 and 4.7 with 1% CaO or 1% limestone, respectively, similar to that of the present work. These results can be related to an increase in lactic acid production. According to Cherney & Cherney (2003), pH is an indicator of the quality of silages

with a low DM content. The increases of pH found in that experiment do not seem to indicate deterioration **a**nd reduction in the aerobic stability of silages. The NDF contents showed differences among the treatments. The ensiled sugarcane associating 1% CaO to biological additive presented the lowest NDF content with no differences among the other treatments. According to Balieiro Neto et al. (2007), the addition of CaO in sugarcane ensiling partially solubilizes hemicellulose and the addition of 2% CaO increases *in vitro* digestibility. Cavali et al. (2006), testing doses of CaO in sugarcane silages, found reduction in NDF and hemicellulose content and increase in digestibility. The results of the NDF contents in this experiment corroborate the findings of these authors. The association of biological additive with 1% CaO can have broken down the cell wall of the forage, thus improving its quality as stated by Van Soest (1994). Some bonds which occur in the cell wall formation are susceptible to alkaline agents.

Conclusions Sugarcane silage treated with *L. plantarum* associated with 15% *A. Pintoi* and the control silage showed the lowest pH values and sugarcane ensiled with *L. plantarum* associated with 1% CaO showed the greatest reductions in the NDF contents among the evaluated treatments.

References

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Table 1. Effect of biological additives, associated with chemical and organic additives in pH and in the Neutral Detergent Fiber content (NDF) of sugarcane silages (*Saccharum officinarum*)

Additives Associated – sugarcane silage	Mean pH	Mean NDF (%)
Biologic + CaO	4.00bc	45.58a
Biologic + Forage peanuts	3.43a	57.22b
Biologic + Leucaena	3.80b	58.41b
Biologic + Urea	3.93bc	60.30b
Biologic (control)	3.60a	65.07b

Means followed by the same letter in the column do not differ by Tukey test ($P<0.05$)