Evaluation of different methods for pH measurement in corn and sorghum silage

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Introduction In Brazil, corn and sorghum silages are the major conserved forage used for cattle (Bernardes, 2012). In silage production, pH measurement is an important step due its correlation with forage fermentative quality. Among the main pH measurement methodologies obtained in literature those described by Silva and Queiroz (2002), Wilson and Wilkins (1972) and Kung Jr. (1984) have major relevance. It is important verifying if these methods can be used for two forages and determine its interactions to dry matter (DM) in order to observe differences between methodologies. Aiming to compare three pH measurement methods in corn and sorghum silage with different dry matter 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 of Santa Maria. The pH was measured in experimental corn and sorghum silages, in a total of 84 measurements (24 sorghum and 60 corn silages). The pH measurements were performed through 3 different methodologies. In Silva and Queiroz (2002) method, 9 grams of silage were put in a 100ml Becker, 60 ml of distilled water were added, the mixture was stirred and after 30 minutes the pH was read. For the method described by Wilson and Wilkins (1972), a hydraulic press was used to extract juice from 200g of silage and then the pH of the extracted liquid was measured. In Kung Jr (1984) methodology, an aqueous extract was obtained by mixing 25g of fresh silage with 225 mL of deionized water that are processed in a blender for about 1 minute, immediately the pH was measured. The pH measured methodologies were performed with the same potentiometer, immediately after silos opening. For dry matter evaluation, a sample of 200g was collected from each silo and then dried in a forced air oven at 55°C for at least 72h until constant weight. The dried samples were milled and 2g subsamples were dried in an oven at 105 ° C for 8 hours for determination of total DM. A completely randomized design, with three treatments (DM content, methodology and silage type) in a factorial scheme was used. The statistical analyzes were performed by PROC MIXED and ANOVA proceedings on SAS package, version 9.2.

Results and discussion No differences were observed in pH measured by different methods (Table 1). Factors such dry matter level and forage type interfered in pH measured values. Through Pearson's correlation coefficient it is possible to note that the relation between pH and DM was negative (-0.17073; P = 0.006). However, these factors should be considered isolated, as an influence, since they did not interact with the methods evaluated in this study.

Table 1 Influence of different methodologies, dry matter level (DM) and forage type (corn x sorghum) and their interactions with pH values of corn and sorghum silages

Source	Pr> F	Means quare
Method	0.9364	0.0009
DM	0.0016	0.3456
Forage	>0.0001	0.0038
DM*Method	0.9011	0.0017
Method*Forage	0.6320	0.0027
Forage*DM	0.0931	0.1000
Forage*DM*Method	0.9551	0.0016

The results show that forage dry matter content is the major interfering factor in pH measurement, which has already been demonstrate by Kung Jr (2010). The forage buffering capacity is also a decisive factor for determine silage pH (Jobim et al., 2007; Kung Jr., 2010). So that, the methodology to be used in pH measurement should be chosen by criteria such as time and resource savings, as well as materials availability to its execution. ANOVA presented the following means and coefficients of variation (CV) for each methodology: pH = 3.84 (CV = 5.14%); pH = 3.83 (CV = 4.78); pH = 3.83 (CV = 5.03) to the methodologies Silva and Queiroz (2002), Wilson and Wilkins (1972) and Kung, Jr. (1984), respectively.

Conclusions The methodologies tested for pH measurement in corn and sorghum silages resulted in similar results. Dry matter content and forage type may influence pH values. The methodology should be chosen according to laboratory characteristics.

References

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