Effect of length of storage on the fermentation profile of reconstituted corn grain silage treated with a chemical additive

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Introduction The majority of the corn grain grown in Brazil has hard endosperm, high vitreousness and low starch digestibility. The rehydration and ensilage of corn grain allows the breakdown of the protein matrix that surrounds the starch granule in the endosperm, increasing the ruminal and total tract starch digestibility. Chemical additives can be applied to increase the aerobic stability of corn grain silage. Therefore, the hypothesis of study was that treatment of reconstituted corn grain silage with Mycoflake™, that contains propionic acid and polysorbate, would lead to a higher aerobic stability. The objective of this experiment was to determine the effect of treatment with propionic acid, polysorbate or propionic acid and polysorbate on reconstituted corn grain silage stored for 15, 30 or 60 days on silage conservation.

Materials and Methods The experiment was conducted at the Department of Animal Science of the Luiz de Queiroz College of Agriculture/University of São Paulo, São Paulo - Brazil. An unknown corn hybrid was ground before ensiling (5-mm screen) and used to make the reconstituted silage. Dry ground corn was mixed with distilled water to achieve a moisture content of 35% and, ensiled in 5-L plastic buckets fitted with sealing plastic cover. The rehydrated corn grain was split into 4 piles (51.7 kg per pile) per treatment. Each pile was treated with the following: (1) without additive (CON); (2) polysorbate 80 (POL) (2 L/t) (Tween™ 80); (3) propionic acid (PRO) (2 L/t) and (4) Mycoflake™ (MYC) (2 L/t) (Kemin América do Sul, Indaiatuba, SP, Brazil). The effect of length of storage (15, 30 and 60 d) was also evaluated, and combined in a factorial arrangement with the effect of additives. Four replicates were used per treatment. Concentrations of volatile fatty acids were determined by gas chromatography with a mass spectrophotometer detector (GCMS QP2010 Plus; Shimadzu, Kyoto, Japan) and the lactic acid content by colorimetric method. Aerobic stability test was performed at each silo opening time (Kung et al., 2000). Data were analyzed using the MIXED procedure of SAS.

Results and Discussion The aerobic stability increased over time; silages treated with propionic acid and Mycoflake presented higher stability than silage without additive or treated with polysorbate at 60 d ($P < 0.01$). Silages were well fermented, with pH values between 3.84 and 4.01, there was interaction between additive and storage length ($P < 0.01$). The acetic acid content was higher at the 30 d of ensilage (15 d = 0.11; 30 d = 0.13; 60 d = 0.12) and in silage treated with Mycoflake (CON = 0.12; POL = 0.11; PRO = 0.11; and MYC = 0.14). There was not effect for lactic acid concentration ($P = 0.15$). Additives containing propionic acid improve the aerobic stability (Kung et al., 2018). There was interaction between additive and storage length ($P < 0.01$) and propionic acid concentration was higher in treatments containing propionic acid than the silage without additive and treated with polysorbate, supporting the results of the increase in aerobic stability.

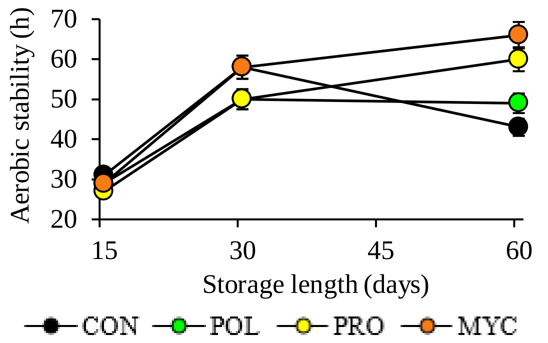

Figure 1. Effect additive (A), *P* = 0.02; effect storage length (S), *P* < 0.01; and interaction between additive and storage length (A x S), *P* < 0.01; SEM = 2.98.

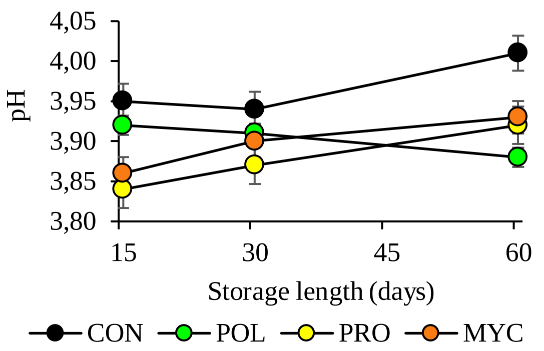

Figure 2. Effect additive (A), *P* < 0.01; effect storage length (S), *P* < 0.01; and interaction between additive and storage length (A x S), *P* < 0.01; SEM = 0.01.

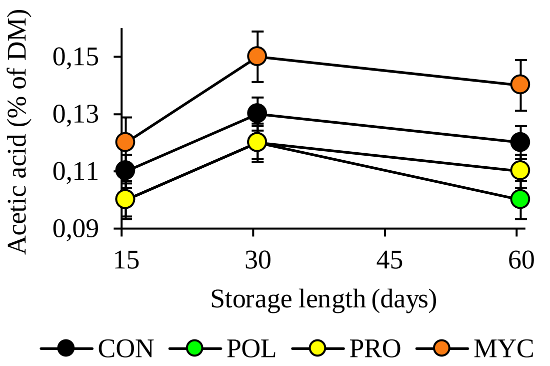

Figure 3. Effect additive (A), *P* < 0.01; effect storage length (S), *P* < 0.01; and interaction between additive and storage length (A x S), *P* = 0.10; SEM = 0.006.

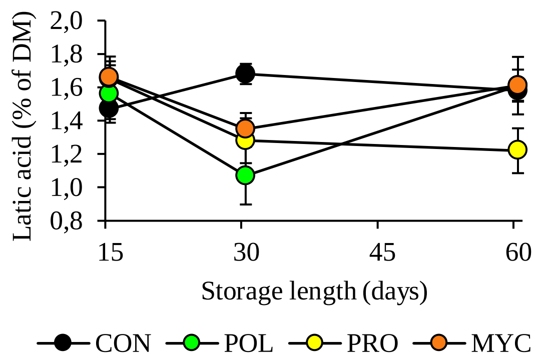

Figure 4. Effect additive (A), *P* = 0.33; effect storage length (S), *P* = 0.10; and interaction between additive and storage length (A x S), *P* = 0.15; SEM = 0.15.

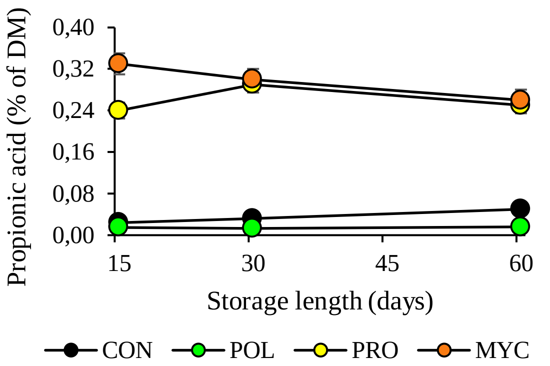

Figure 5. Effect additive (A), *P* < 0.01; effect storage length (S), *P* < 0.01; and interaction between additive and storage length (A x S), *P* < 0.01; SEM = 6.11.

Conclusions Reconstituted corn grain silages were well fermented and Mycoflake was efficient to increase the aerobic stability of the reconstituted corn grain silage.

References

Kung Jr., L. 2000. Microbial and chemical additives for silage: effect on fermentation and animal response. In: Workshop Sobre Milho Para Silagem, 2., Piracicaba, 2000. Anais Piracicaba: FEALQ, 1-53.

Kung Jr., R. D. Shaver, R. J. Grant, and R. J. Schmidt. Silage review: Interpretation of chemical, microbial, and organoleptic components of silages. J. Dairy Sci. 101: 4020 - 4033.