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Aerobic stability of corn silage with increasing levels of soybean meal

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Corn silage is a feed traditionally used for ruminants, widely used by producers due to its productivity, fermentative capacity, and aerobic stability, despite its protein deficiency. Adding soybean meal to corn ensiling can increase the crude protein content of the silage. However, it's important to find the optimal inclusion level of this meal without compromising the fermentative process and aerobic stability of the silage. Therefore, this research aimed to evaluate the effect of including soybean meal in corn silage on the aerobic stability parameters of the silage. Experimental silos made of polyvinyl chloride tubes (50x10 cm) were used with four levels of soybean meal inclusion (0, 15, 20, and 25%, based on DM content), with four replicates per treatment, totaling sixteen experimental units distributed in a completely randomized design. The experimental silos remained sealed for 96 days. After this period, the silos were opened in a room with controlled temperature at 25°C, and the silages were exposed to air for 168 hours, with their temperatures measured every hour on the first day, every two hours on the second day, every three hours on the third day, and every four hours from the fourth day onwards. Aerobic loss was considered when the silage mass reached 2°C above ambient temperature (25±0.5ºC). The following parameters were evaluated: aerobic stability (AS, in hours); the maximum difference in silage temperature in relation to the ambient temperature (DTAS, in °C) and the sum of the difference in silage temperature in relation to the ambient temperature (∑TSA, in °C). The data were subjected to analysis of variance and regression at a significance level of α=0.05 using the SISVAR software. AS showed a linear increasing effect (P<0.001) with soybean meal inclusion. The AS showed a significant linear increasing effect (P<0.001) with the inclusion of soybean meal, increasing by 5.14 hours for each 1% of soybean meal added to corn ensiling, as demonstrated by the model. Soybean meal inclusion reduced the ∑TSA (P<0.007), with the regression model showing a decrease of 0.19°C for each 1% inclusion of soybean meal. Thus, variations in temperatures occurred in the current experiment, because the higher the ∑TSA value, the lower its stability when exposed to air. However, DTAS showed a quadratic effect (P<0.019) due to soybean meal inclusion, with a maximum point of 3.24°C for 10.17% inclusion of soybean meal. This effect demonstrates that increased dry matter in silages promotes osmotic pressure, leading to reduced activity of deleterious microorganisms. Therefore, silages with soybean meal inclusion remained stable throughout the exposure period, unlike the control treatment (0% soybean meal inclusion), which lost its aerobic stability within 48 hours of exposure to air. It can be concluded that soybean meal inclusion in corn ensiling improves the aerobic stability of silage, with a recommended inclusion level of 15%.

Keywords: Deterioration, ensiling and fermentation.