Microbiological characterization, fermentative parameters and aerobic stability of corn silages with and without inoculant, relocated after different exposure times

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Introduction The use of relocated silages has increased in the feeding of ruminants, mainly in the dry period of the year. Relocation of commercial silage involves unloading, transportation, repacking, and sealing in the new silo. Due to this process, the silages can be exposed to air at the time of relocation, which may favor dry matter losses, due this practice may take either few hours or days (Chen et al., 2014). The susceptibility of the silage to aerobic deterioration in this first stage of the exposure is still poorly understood and may vary with the silage quality and exposure time. The objective of this study was to evaluate the effect of exposure time to air during the relocation on the aerobic stability of corn silage untreated and treated with a commercial inoculant.

Material and Methods The corn crop was cultivated on a farm located at latitude 03° 02' 2" South and longitude 47° 20' 18" West. The corn hybrid used for the silage was 30F90H Pioneer that was harvested close to 2/3 of the milk line and ensiled in 24 plastic drums with 200 L each. The experiment was conducted in a completely randomized design with four treatments and six replicates. The treatments were: silage without inoculation and relocation (control); Silage relocated after 12 hours of aerobic exposure; Silage inoculated with *L. plantarum* ($1.0x10^5$ per gram of silage) and relocated after 12 hours of aerobic exposure, and silage relocated after 24 hours of aerobic exposure. In the first ensiling, the silos were kept closed for 30 days, unloaded, exposed to air according to their respective times, relocated and reopened after 30 days of relocation. In the second silos opening time, N-NH3, count of molds, and yeasts were determined. The temperature and pH (Bolsen et al., 1992) were determined on silage that remains exposed in a controlled environment (25 ° C) for 12 days. Data were subjected to analysis of variance and means were compared by "Tukey" test with 5% level of probability.

Results and Discussion No difference ($p>0.05$) was observed in the population of microorganisms between the different silages (Table 1). Inoculated silages presented lower ($p<0.05$) ammoniacal nitrogen production in relation to the silages relocated after 24h of exposure, indicating the lower occurrence of proteolysis. The silages relocated after 24h of exposure to the air presented higher ($p<0.05$) time to reach the maximum temperature in relation to the control silages. There was interaction ($p<0.05$) silage × days of pH evaluation after the unloading (Table 2). An increase ($p<0.05$) in pH was observed in all silages with the evaluation days after the second unloading. Silages exposed for 24 hours presented lower pH and differer from the others on the 8th day of evaluation. Probably, the losses of moisture and sugars in the relocation of these silages difficult the growth of microorganisms (Pahlow et al., 2003), making a slower increase of temperature and pH. There was no difference ($p>0.05$) in the time in aerobic

stability among silages. Possibly, the small changes observed in the characteristics of the silages were not enough to affect the time of deterioration.

Table 1 Fermentative, microbiological and aerobic stability characteristics of corn silages with or without inoculation submitted to different exposure times

Item[1]	Control	R-12h[2]	IR-12h[3]	R-24h[4]
Ammoniacal nitrogen	2.5^{ab}	2.9^{ab}	2.3^{b}	3.0^{a}
Yeasts (cfu g^{-1})	<2.0	<2.0	<2.0	<2.0
Molds (cfu g^{-1})	<2.0	<2.0	<2.0	2.2
Maximum temperature (°C)	28.8 ^{ab}	29.9^{a}	29.8 ^{a}	25.8^{b}
Amplitude (°C)	7.3^{ab}	9.1^{a}	9.9^{a}	4.3^{b}
THM (h)	104.7^{b}	122.2^{ab}	75.8^{b}	179.3^{a}
Stability time (h)	56.2	48.2	54.8	60.8

[1]THM (h)= Times in Hours to reach the Maximum Temperature; [2]R-12h= Relocated after 12 hours of exposure; [3]IR-12h= Inoculated and relocated after 12 hours of exposure; [4]R-24h= Relocated after 24 hours of exposure. Means followed by different lowercase letters differ by Tukey test (P<0.05).

Table 2 pH variations during the aerobic stability of corn silages inoculated or not submitted to different exposure times

Evaluation days	Control	R-12h[2]	IR-12h[3]	R-24h[4]
1	3.44 ^{Da}	3.26 ^{Ea}	3.23 ^{Ea}	3.31 ^{Da}
2	3.44 ^{Da}	3.26 ^{Ea}	3.23 ^{Ea}	3.32 ^{Da}
3	3.71 ^{CDa}	3.71 ^{DEa}	3.73 ^{DEa}	3.82 ^{CDa}
4	3.87 ^{CDa}	3.90 ^{CDEa}	4.02 ^{CDEa}	3.89 ^{CDa}
5	4.23 ^{BCDa}	4.09 ^{BCDEa}	4.31 ^{BCDa}	3.99 ^{BCDa}
6	4.43 ^{BCa}	4.30 ^{BCDa}	4.64 ^{ABCa}	4.07 ^{BCDa}
7	4.83 ^{Ba}	4.59 ^{BCa}	5.00 ^{ABa}	4.19 ^{ABCa}
8	4.91 ^{ABa}	4.80 ^{Ba}	5.04^{ABa}	4.12^{ABCDb}
9	5.30 ^{Aa}	5.71 ^{Aa}	5.33^{Aa}	4.64 ^{ABCa}
10	5.33 ^{Aa}	5.79 ^{Aa}	5.22^{Aa}	4.61 ^{ABCa}
11	5.51 ^{Aa}	5.86 ^{Aa}	5.84^{Aa}	4.85 ^{ABa}
12	5.56 ^{Aa}	6.44 ^{Aa}	5.67^{Aa}	4.97 ^{Aa}

[1]R-12h= Relocated after 12 hours of exposure; [2]IR-12h= Inoculated and relocated after 12 hours of exposure; [3]R-24h= Relocated after 24 hours of exposure. Means followed by different lowercase letters differ by Tukey test (P<0.05).

Conclusions Relocation, after 12 and 24 hours of exposure to air, does not affect the aerobic stability of corn silages. Inoculation with *L. plantarum* on corn silage does not affect the aerobic stability of the relocated silages after 12 hours of exposure to air.

References

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