Fermentation characteristics and microbial composition of corn silages stored at different times after the relocation

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Introduction The absence of forage planning or annual variations in climatic conditions may limit the supply of forage to the herds during periods of drought, and this has contributed to the increase in the commercialization of silage. Such practice is most often performed by the relocation of silages into bags or into conventional silos. However, it is not yet established how long after the relocation in a new silo the silage can be used, since the material has already been acidified and passed through a fermentation process previously. Thus, the objective of this research was to determine the effect of different storage times after the relocation of corn silages on the fermentative characteristics and the microbiological composition of these.

Materials and Methods The corn crop was cultivated on a farm located at latitude 01º07'44" South and longitude 47º37'12" West. Corn was harvested when it had a dry matter content of 30 to 35% and ensiled in conventional trench-type silos. After 150 days of ensiling, the silo was unloading and the silage exposed to air in piles for 9 hours. Subsequently, the silage was relocated in 28 mini experimental silos (plastic buckets with a capacity of 15 liters), where 9 kg of forage mass was stored in order to reach a density of 600 kg/m³. Seven silage storage times after the relocation (control; 2; 4; 8; 16; 32; 64; and 128 days) were evaluated in a completely randomized design with four replications. After the unloading the mini silos, was determined of the ammonia nitrogen (Bolsen et al., 1992) and count of molds and yeasts. The pH values were determined according to Bolsen et al. (1992) during seven days after opening the silo. The determination of the aerobic stability and measurements of the temperature variables were performed with a datalogger thermometers in a temperature controlled room for seven continuous days. The results were submitted to analysis of variance and the means were compared using the Tukey test at the 5% probability level.

Results and Discussion No difference ($P>0.05$) was observed in the count of molds, yeasts, and ammonia nitrogen values with the different silage storage times (Table 1). However, there were differences ($P<0.05$) in the temperature variables of the silages, such as aerobic stability (STA), amplitude (AMP), times in hours to reach the maximum temperature (THM), and maximum temperature (TMÁX). The silages that were stored for more than 32 days presented higher ($P<0.05$) aerobic stability when compared to those that remained less time stored. In the same way, these took a longer time ($P<0.05$) to reach the maximum temperature. Silages stored for less than 32 days, as well as silages that were not reallocated, presented higher ($P<0.05$) maximum temperatures (MÁXT) as well as for amplitude (AMP). There was an interaction ($P<0.05$) storage time × time on exposure to the pH values of the corn silages studied. Silages stored for 128 days showed the lowest pH, in comparison to the other treatments (Table 2). During the unloading of the silo, organisms mainly yeast and acetic acid bacteria proliferate and begin the consumption of soluble sugars, lactic acid and other acids (Rooke and Hatfield, 2003).

Table 1 Microbial composition, ammonia nitrogen and temperature of corn silages stored at different times after the relocation

	Days of storage (treatments)						
Items	control	4	8	16	32	64	128
Molds., log (cfu g^{-1})	7,44	15,4	4,37	10,18	5,81	12,4	5,22
Yeasts, log (cfu g^{-1})	7,69	7,5	9,63	<2,0	11,15	11,14	<2,0
Ammonia nitrogen	7,11	6,43	6,45	6,26	7,06	6,8	6,72
STA	2,50d	11,25b	31,75b	50,50c	150,50a	219,00a	256,00a
AMP	14,70a	14,30a	15,35a	11,83a	10,28ab	5,20b	2,20b
THM	24,50b	45,00b	59,25b	92,25bc	229,25a	258,00a	281,00a
MAXT	40,70a	40,30a	41,35a	37,83a	36,28ab	31,20b	28,20b

control- control silage (Silage from the silo after aerobic exposure); cfu - colony forming units; Ammonia Nitrogen- In percentage of total nitrogen; STA- Hours in stability; THM- Times in Hours to reach the Maximum Temperature; AMP- Amplitude; MAXT- Maximum temperature. Means followed by different lowercase letters differ by the Tukey test (P<0,05).

Table 2 pH values of corn silages stored at different times after relocation during seven days of aerobic exposure

DE[1]	Days of storage (treatments)						
	control	4	8	16	32	64	128
1	4.0Da	3.80Dab	3.64Da	3.86Ca	4.35Cb	4.02Ca	3.67Cc
2	6.9Ba	6.18Bb	5.12Bc	4.28Ccd	4.42Ccd	4.29Ccd	4.12Bd
3	7.5 Ba	6.20Ba	6.4Ba	5.14Bb	4.39Cb	4.72Bb	4.21Bb
4	7.6Aa	7.27Ba	6.75Ba	7.11Ba	5.22Bb	5.20Bb	4.26Bc
5	7.2Ba	7.33Ba	7.00Ba	7.50Ba	5.54Bb	5.74Bb	4.33Bc
6	7.2Ba	7. 41Ba	7.08Ba	7.46Ba	6.39Bbc	6.64Bbc	4.38Bad
7	7.2Bb	7.88Aa	7.15Aab	7.59Aab	7.35Aab	7.54Aab	5.13Ac

[1]DE = Days in which corn silage was exposed during aerobic stability; Lowercase letters differ between treatments on rows; Upper case letters differ between days of aerobic exposure in the column. Means followed by different lowercase letters differ by the Tukey test (P<0,05).

Conclusion After 32 days of storage after the relocation, corn silages were shown to be more stable considering the variables under study.

References

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