

Microbial composition, ammonia nitrogen and aerobic stability of corn silages relocated after different aerobic exposure times

A.C.M, Queiroz¹, R.I.R. Santos¹; R.C.A. Mendonça¹; W.M. Santos¹; C.M.S. Ferreira¹, M.V.S.B. Cardoso², C. Faturi¹, F.N. Domingues¹; A.C. Rêgo¹;

¹Federal Rural University of the Amazon, Belém/PA, Brazil, e-mail: amandaqueiroz201318@gmail.com, ²Federal University of Lavras, Lavras/MG.

Keywords aerobic deterioration, maximum temperature, molds, yeasts.

Introduction The absence of forage budgeting on farms and changes in the climate for a few years may limit the availability of forage during drought periods. To circumvent this situation, some producers have acquired silages in the market, and when this occurs the silage is inevitably exposed to air for variable periods until it is relocated at the destination, becoming subject to possible aerobic deterioration (Ranjit; Kung, 2000). Such exposure may potentiate the action of undesirable microorganisms and consequently modify the fermentative characteristics after the relocation. The objective of this study was to determine the effect of exposure time to corn silage air during the relocation under the microbial composition and the aerobic stability.

Material and methods The corn crop was cultivated on a farm located at latitude 03° 02' 2" South and 47° 20' 18" longitude West. Was used the variety Pioneer 30F90H, the corn was harvested with a dry matter content of 32.5%. As mini experimental silos were used plastic buckets with a capacity of 15 liters, where were placed 9 kg of forage mass to reach the density of 600 kg / m³, containing sand washed in the bottom for characterization of losses. After 30 days of sealing the mini silos were unloading and the silages were exposed to air in the form of piles. The treatments were, the times of aerobic exposure (0; 6; 12; 18; 24; 30; 36; 48, 60 hours) plus the control, that were not exposed. Three repetitions for treatment were used. After exposure, the silages were relocated in the same mini-silos of origin and kept stored for another 30 days until the second opening. Subsequently, the mini silos were stocked and were determined levels of ammonia nitrogen (Bolsen et al; 1992; e Vieira, 1980) and counts of yeasts and molds. The determination of the aerobic stability and measurements of the temperature variables were performed with the aid of a thermometer datalogger in a room with controlled temperature for 12 days uninterrupted. Data were submitted to analysis of variance and the averages were compared using the Tukey test at the 5% probability level.

Results and discussion No difference ($P > 0.05$) was observed in the microbial counts (yeasts and molds) of corn silages exposed to air at different times (Table 1). However, an increase ($P < 0.05$) in ammonia nitrogen (N-NH₃/%TN) was observed with increasing silage exposure time. It was observed that silages exposed after 30 hours presented values of ammonia nitrogen above 7.0%, probably due to the higher proteolysis in these silages. Some factors may influence the proteolysis during silage, among them are dry matter content, pH and silage temperature (McDonald., et al. 1991) which may vary at the time of exposure during relocation.

Regarding the temperature variables (Table 2), only the hours in stability (STA) did not differ ($P > 0.05$) as a function of the aerobic exposure. The variables time in hours to reach maximum temperature (THM), amplitude (AMP) and maximum temperature (MAXT), differed ($P < 0.05$) with the exposure of silages to air. Silages exposed in less than 30 hours as well as non-exposed

silages (control group), took longer to reach the maximum temperature (THM) than the other silages. The treatments that tended to present higher values of amplitude were the least exposed, (control, 0, and 12 hours), which also was repeated for maximum temperature. The treatments exposed for 24 hours did not reach such high temperature because they were more unstable than the others.

Table 1 Microbial composition and ammonia nitrogen of corn silages relocated after aerobic exposure.

Item	Hours of aerobic exposure (treatments)										SE
	Con	0	6	12	18	24	30	36	48	60	
LEV(ufc g-1)	<2.0	<2.0	<2.0	<2.0	2.7	3.1	3.2	2.7	3	3.3	1.20
F.F (ufc g-1)	2.0	4.7	3.6	4.7	4.2	3.5	6.4	4.5	4.9	5.3	1.29
N-NH3(%NT)	5.2 ^c	6.1 ^b	6.2 ^b	6.3 ^b	6.5 ^{ab}	6.7 ^a	7.1 ^a	7.1 ^a	7.2 ^a	7.4 ^a	0.22

Con- control silage (Silage from the silo after aerobic exposure); N-NH3(%NT) – Ammonia nitrogen in percentage of total nitrogen; cfu - colony forming units; SE- Standard Error; Means followed by different lowercase letters differ by the Tukey test (P<0.05)

Table 2 Aerobic stability and temperature data of corn silages relocated after aerobic exposure.

Item	Hours of aerobic exposure (treatments)										SE
	Con	0	6	12	18	24	30	36	48	60	
STA (h)	64.3	103.0	104.7	117.7	121.3	140	49.3	2.0	39.7	45.6	21,65
THM (h)	128.3 ^{ab}	163.0 ^a	195.3 ^a	152.0 ^a	169.3 ^a	148.0 ^a	70.0 ^b	2.0 ^b	53.0 ^b	142.7 ^{ab}	1,23
AMP (°C)	8.1 ^a	8.3 ^a	5.5 ^{ab}	8.1 ^a	5.8 ^{ab}	2.1 ^b	1.8 ^c	3.6 ^b	5.5 ^{ab}	5.5 ^{ab}	2,46
MAXT(°C)	29.6 ^a	30.3 ^a	27.0 ^a	29.6 ^a	27.3 ^a	23.3 ^b	23.3 ^b	25.1 ^{ab}	27.0 ^{ab}	27.0 ^{ab}	3,11

Con- control silage (Silage from the silo after aerobic exposure); STA- Hours in stability; THM- Times in Hours to reach the Maximum Temperature; AMP- Amplitude; MAXT- Maximum temperature; SE- Standard Error; Means followed by different lowercase letters differ by the Tukey test (P<0.05)

Conclusion From 24 hours of aerobic exposure before relocation to new silo, the silages were shown to have higher values of ammonia nitrogen and more aerobic unstable.

References

- BOLSEN. K.K.; LIN. C.; BRENT. B.E. Effect of silage additives on the microbial succession and fermentation process of alfalfa and corn silages. *Journal of Dairy Science*. v.75. p.3066-3083. 1992.
- McDONALD. P.; HENDERSON. A.R.; HERON. S. 1991. *The biochemistry of silage*. 2^a ed. Marlow: Chalcombe Publications. 340. p
- RANJIT. N.K; KUNG JR. L. The Effect of *Lactobacillus buchneri*. *Lactobacillus plantarum*. or a Chemical Preservative on the Fermentation and Aerobic Stability of Corn Silage. *Journal of Dairy Science*. v. 83. p. 526–535. 2000.
- VIEIRA. P.F. Effect of formaldehyde on the protection of proteins and lipids in ruminant diets. 1980. 98f. Thesis (PhD in Animal Science) - Federal University of Viçosa. MG. 1980.