

Influence of storage period on the quality of a maize silage

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Introduction On farms, sometimes maize is ensiled after harvest, and the feed-out of a maize silage begins immediately. Wichert et al. (1998) showed that silages with poor hygienic quality cause decreases in feed intake by about 10-20%. An experiment was conducted to investigate the influence of the storage period of a maize silage on fermentation quality, microbiological quality and aerobic stability.

Material and Methods Six 700-L containers were filled with maize at an average dry matter (DM) content of 37%. The density of the forage amounted to 171 +/- 10 kg DM/m³. With three of the containers, the feed-out period started the day after ensiling; three other containers were sealed, and the feed-out phase started after a two-month storage period. The following three treatments were applied both to the silage removed immediately and to the silage fed out after the two-month storage period: (1) 5-cm layer fed out daily; (2) 10-cm layer fed out daily; and (3) 5-cm layer fed out daily, with the maize being treated with a silage additive (chemical product, active ingredient ammonium propionate, dosage 6 kg/t) at the time of ensiling. The maize silage removed daily was weighed, and on days 0, 1, 4, 7, 10, 14 and 18, samples were taken to analyse pH and microbiological parameters (yeasts and moulds) and aerobic stability. For the statistical analysis all microbial counts were log₁₀-transformed. Data were analysed using analysis of variance (Systat 13).

Results and Discussion In the silages whose feed-out period started the day after ensiling, the fermentation process began modestly, and the pH decreased slowly to 4.7 on average (Figure 1). On the other hand, after the two-month storage period, the lactic fermentation process in the silages was completed, and an average pH of 4.1 was reached. Between the feed-out periods the pH values were significant ($P < 0.01$). Between the treatments the pH values showed a tendency ($p = 0.051$).

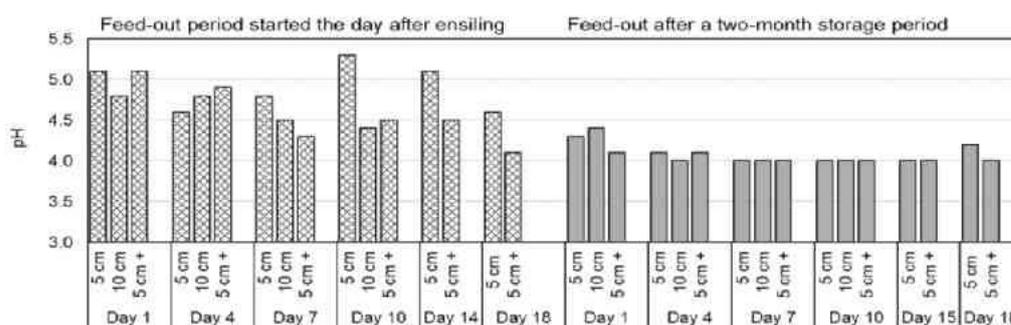


Figure 1. pH values in the maize silages.

In the silages whose feed-out period started immediately, the silages were characterised by high numbers of yeasts (Figure 2) and moulds (Figure 3). According to the VDLUFA quality assessment (VDLUFA 2012), many samples were classified as category 4, meaning they were spoiled. For the yeasts the feed-out periods ($p < 0.01$) and the treatments ($p < 0.01$) were significant. For the moulds only the feed-out periods were significant ($p < 0.001$). In nearly all 700 L containers, where the feed-out period started the day after ensiling, the silages were already warm. The test of aerobic stability showed they were aerobically instable (Figure 5). This was also the case when the silage was treated with the additive. After the two-month storage period, the numbers of various microorganisms were in most cases within the normal range, and the silages had a better aerobic stability. On average the aerobic stability amounted 77 hours instead of 6 hours for the immediately feed-out ($p < 0.001$). Both

the removal of a larger layer and treatment with a silage additive further improved the aerobic stability of the silages ($p < 0.5$).

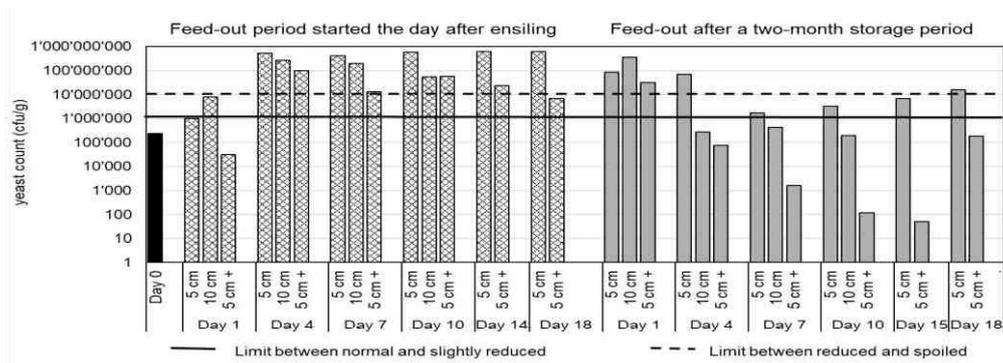


Figure 2. Yeast count in the maize silages (cfu: colony forming units).

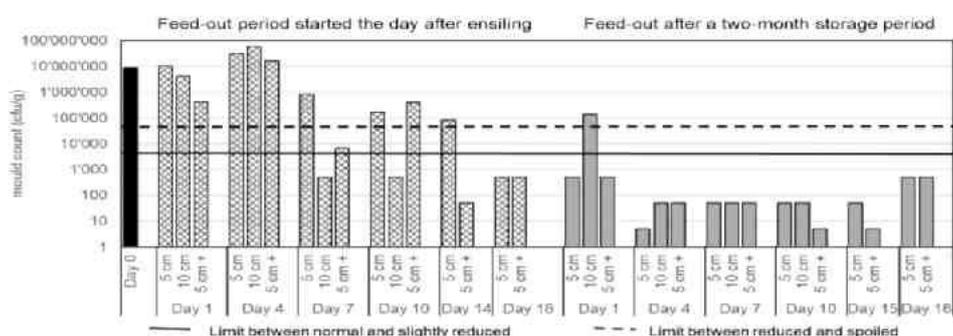


Figure 3. Moulds in the maize silages (cfu: colony forming units).

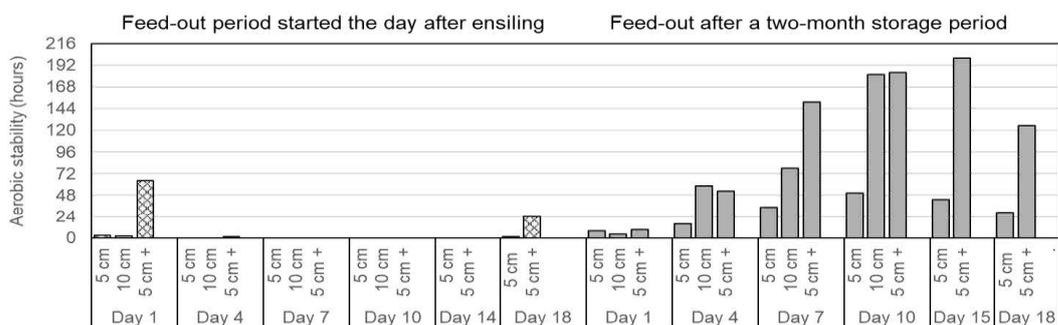


Figure 4. Aerobic stability of the maize silages.

Conclusion Due to the high numbers of yeasts and moulds, feeding out the maize silage immediately after ensiling cannot be recommended. After the two-month storage period, various microorganisms were in most cases within the normal range, and the silages had a better aerobic stability.

References

- VDLUFA (2012) Keimgehalte an Bakterien, Hefen, Schimmel- und Schwärzepilzen. Methodenbuch III, Die chemische Untersuchung von Futtermitteln, 8. Ergänzungslieferung 2012.
- Wichert, B., Kienzle, E. & Bauer, J. (1998) Palatability and intake of silage in dairy cows, in relation to hygienic quality. *Journal of Animal Physiology and Animal Nutrition*, 80, 253–259.