Effect of residual sugar in high sugar grass silages on aerobic stability

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Introduction New varieties of *Lolium perenne*, bred for high sugar content, can contain up to 30% of water soluble carbohydrates (WSC). Only a fraction of such high contents are metabolised during a normal fermentation and the high residual sugar content (RSC) of these silages can improve the efficiency of use of nitrogen by ruminants. However, these RSC at opening for feed-out could be preferentially metabolised relative to fermentation products by all aerobically growing fungi and bacteria present on the forage. A high RSC thus can increase the risk of aerobic deterioration over that of extensively fermented silages, containing predominantly organic acids, which are initially utilised by certain yeasts. The objective of this study was to assess the relationship between RSC and aerobic stability of silages prepared with either optimal ensiling conditions or with a defined air challenge treatment to make them prone to aerobic deterioration. The latter is a useful method to test the efficacy of aerobic stability improving silage additives, requiring unstable controls (Pahlow *et al*., 1999).

Materials and methods *Lolium perenne* from experimental plots was mown, wilted, chopped and ensiled in laboratory scale silos. Ten silages (3 reps.) were stored at 25°C for 90 days in gas tight containers (Group A) or for only 49 days with a defined air challenge treatment for 24 hours after 4 and 6 weeks of storage respectively (Group B). The silages were analysed for RSC and for yeasts on lactate agar. The aerobic stability was measured over 7 days by recording the days to persistent temperature rise by 3°C above 20°C ambient (Honig, 1990).

Results In Figures 1 and 2 mean RSC and corresponding aerobic stability are given for 10 silages respectively in Groups A and B, both arranged according to increasing RSC. For both groups stability varied with no noticeable relationship to RSC. The coefficients of correlation were r = -0.07 and -0.03 respectively. In Group A completely stable silages were observed with both low and high RSC. In contrast, Group B silages were 100 times higher in yeasts (>10^5 vs. 10^3 colony forming units per gram fresh matter) and had considerably shorter stability irrespective of their RSC, ranging from 5 up to 110 g WSC/kg.

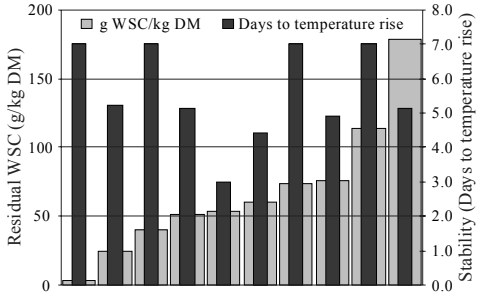

Figure 1 Stability and sugar content of 10 silages after 90 days under optimal gastight storage conditions

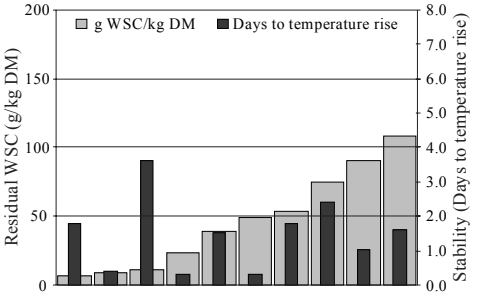

Figure 2 Stability and sugar content of 10 silages after 49 days storage with an air challenge treatment

Conclusion Optimal, gastight ensiling conditions allow the production of aerobically stable silages irrespective of their residual sugar content. Ingress of air during storage leads to aerobic instability caused by yeasts. In both cases (Groups A and B) there was no direct relationship between RSC and aerobic stability after silo opening.

References

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