Improvement of aerobic stability and reduction of aerobic dry matter losses in different silage materials by biological inoculants containing *Lactobacillus brevis*

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Introduction Aerobically instable silages are typically characterized by heating caused by yeast growth, which is unfavourable in many aspects. Spoilage by yeasts is an energy consuming process which results in high energy losses due to ethanol fermentation but also in degradation of dry matter. In addition aerobic spoilage favours mould growth and consequent production of mycotoxins. Therefore aerobic instability in silage is usually not only an animal health issue, but also an economic challenge. This challenge was now addressed by inoculating silage with inoculants containing, among others, *Lactobacillus brevis*, a specie of heterofermentative lactic acid bacteria. Heterofermentative lactobacilli are able to produce acetic acid in addition to lactic acid. Since acetic acid is a known inhibitor of fungi, the intention of adding *L. brevis* is to ameliorate aerobic stability and reduce aerobic surface losses.

Materials and Methods Five different lab scale silage trials were conducted in different materials (grass, clover-grass mix, field beans (whole plant), maize (whole plant and mashed grains) between 2008 and 2010. Trials compared untreated silages with silages treated with either Biomin® BioStabil Plus (2 x 10^5 cfu/g silage) or Biomin® BioStabil Mays (1 x 10^5 cfu/g silage), both of which contain *Lactobacillus plantarum*, *Enterococcus faecium* and *Lactobacillus brevis* in different ratios. Sample silos were prepared in triplicates per trial group in sizes of about 2 kg. The trial time was 90 (± 3) days after which the silos were sampled and analysed for aerobic stability by differential temperature measurement according to Honig (1990). Silages were considered unstable if the temperature in the silage increased to more than 3°C above ambient temperature (23 ± 2 °C). At the end of stability testing surface losses were determined by drying (105°C, 24 h) and differential weighing of the dry matter. Statistics were carried out with SPSS 10.0 using T-test and ANOVA for meta-analysis preceded by tests for normal distribution.

Results and Discussion It was found that aerobic stability was improved in most silages (with the exception of clover grass) by 1.5 – 3.0 days with addition of the inoculant (Figure 1). The stability improvement was statistically significant ($P<0.05$ in whole plant maize and $P<0.1$ in meta-analysis over all trials). Aerobic losses of dry matter were markedly decreased in most trials, especially within grass and maize silages they were reduced by up to 6.0 % ($P>0.05$). Even in the clover grass trial where there was no difference in duration of aerobic stability aerobic dry matter loss was reduced by 0.4% (Figure 2).

Conclusions The inoculants Biomin® BioStabil Plus and Biomin® BioStabil Mays were both found suitable to improve aerobic stability of green forage and maize silages. Both additives cause longer inhibition periods of moulds and yeasts than can be expected in untreated silages. Furthermore the economic loss of dry matter upon the exposure of the silage surface to air is diminished.

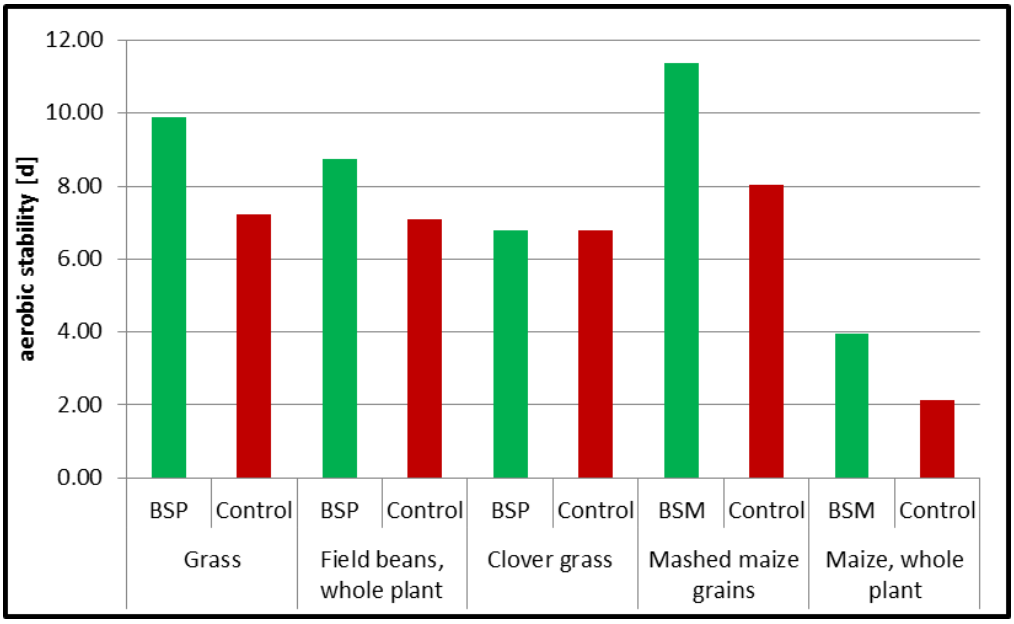

Figure 1: Aerobic stability of treated *vs*. untreated samples (n =3)

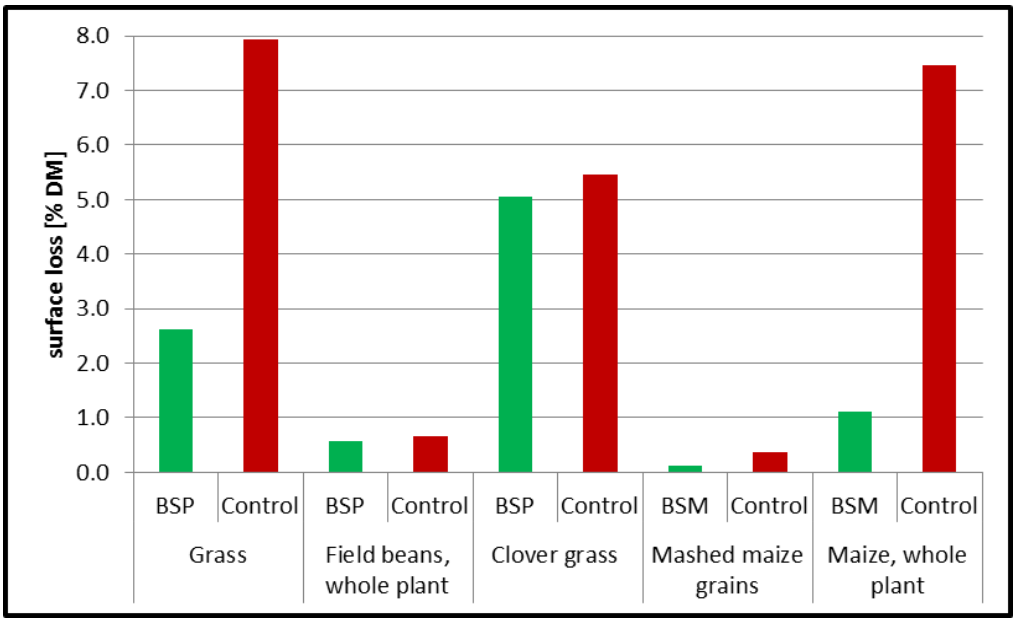

Figure 2: Aerobic dry matter loss in treated *vs*. untreated samples (n =3)