Low doses of *Lactobacillus brevis* strongly improve quality of grass silage

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Introduction *Lactobacillus brevis* strains are frequently found in fermented foods and silage (Teixera, 1999), and are occasionally also used as inoculants for silage (Tobía et al., 2008; Burghardi et al., 1980). As a heterofermentative species of lactic acid bacteria *Lactobacillus brevis*, when used as a silage inoculant, would be expected to improve aerobic stability of silages. In this trial the properties of one *L. brevis* strain (DSM 23231) to improve the quality of fermentation with respect to acidification, dry matter loss and suppression of undesired microorganisms was investigated in a lab scale silage trial.

Materials and Methods In a lab scale silage trial with wilted grass (Austrian meadow grass, ~38% dry matter (DM) *Lactobacillus brevis* was used as an inoculant at concentrations of 5×10^4 and 2×10^5 cfu/g. Treated silages were compared to untreated control silages. For each treatment group sample silos were prepared in triplicate per sampling day. Silos were sampled 3, 7, 48 and 92 days after ensiling using silos of 0.5 kg (day 3, day 7) and 2 kg (day 48, day 92), for different days of analysis. The set of analyses carried out at each sampling day comprised determination of Clostridia spores via MPN method, analysis of carbohydrates and organic acids via HPLC, pH measurement via single rod measuring cell, determination of the dry matter (DM) loss via drying (105°C, 24 h) differential weighing and calculation and statistical evaluation (SPSS 19.0, ANOVA plus Tukey HSD or Tamhane T2, U-tests for Clostridia).

Results and Discussion The use of *L. brevis* significantly reduced DM losses by day 92. (loss reduction of 1.0 - 1.5% independently of dosage (Figure1)) Acidification was strongly facilitated by inoculation with *L. brevis* (Figure 2) as pH values were significantly lower in the treated groups than in the untreated control at all points of time. As a consequence of the low pH value spoilage by clostridia was reduced - the amount of clostridia spores was lowered by up to 3 orders of magnitude by both concentrations of *L. brevis* (Figure 3), which led to a difference in butyric acid fermentation of about 20 – 30 g butyric acid/kg DM between treated and untreated samples. The effect was statistically significant on day 92 independently of dosage. (Figure 4)

Conclusion It is concluded that *Lactobacillus brevis* DSM 23231, even at low dosages of 5×10^4 cfu/g silage, considerably improves fermentation quality of grass silages.

References

Teixera, 1999, "*Lactobacillus brevis*", Encyclopedia of Food Microbiology, 1144-1151.

Tobía et al., 2008, "Nutritional value of soybean (*Glycine max* L. Merr.) silage fermented with molasses and inoculated with *Lactobacillus brevis* 3", Livestock Research for Rural Development 20 (7), online: http://www.lrrd.org/lrrd20/7/tobi20106.htm , 2011-06-07.

Burghardi et al., 1980, "Evaluation of Corn Silage Treated with Microbial Additives", J. Anim. Sc. 50:729-736.

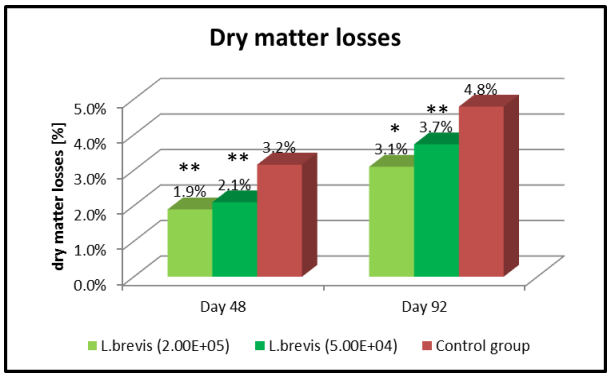

Figure 1 – DM losses in treated and untreated silage samples (n=3)[(1)]

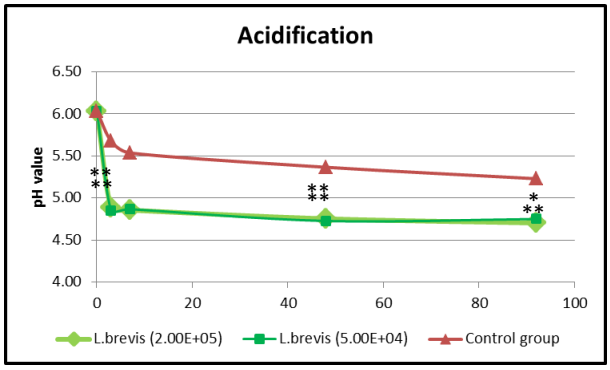

Figure 2 – Acidification of treated and untreated silage samples (n=3)[(1)]

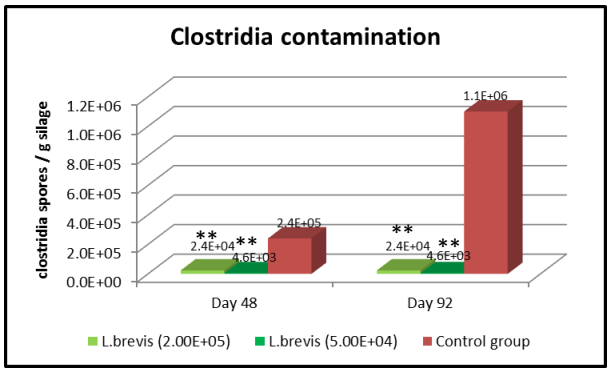

Figure 3 – Amount of clostridia spores in treated and untreated silage samples (n=3)[(1)]

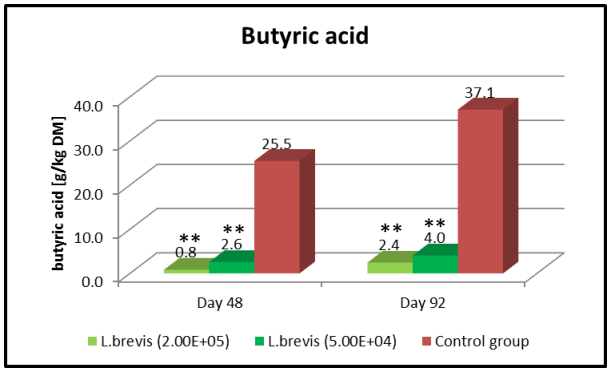

Figure 4 – Butyric acid in treated and untreated silage samples (n=3)[(1)]

[(1)] *P<0.1, **P<0.05