Stability enhancing effects of *Lactobacillus brevis* on maize silages

K. Schöndorfer[1], Y. Acosta Aragón[2], M. Checoli[3], A. Gruber[1] and G. Schatzmayr[1]
[1]*Biomin Holding GmbH, Technopark 1, 3430 Tulln, Austria;*[2]*Biomin Holding GmbH, Industriestraße 21, 3130 Herzogenburg, Austria;* [3]*SANPHAR Saúde Animal Ltda.* *Estr. Municipal Campinas / B. Campo Grande, s/n°, km 8.5, Caixa Postal N° 1082*

Introduction Upon exposure of silage to air the fungal population starts to propagate. This includes the growth of yeasts, which can be observed as heating on the one hand and visible colonies on the other hand, leading to large economic losses. Such losses can be related to health issues of animals fed contaminated silage, to energy losses of up to 40 % by ethanol fermentation, to shrinkage of the dry matter amount or to portions of the silo which have to be discarded. They can, however, be counteracted if silage is well-preserved and contains anti-fungal substances like inhibiting organic acids. Among these, acetic acid is known as a potent inhibitor, and it can be quite easily produced by heterofermentative species of lactic acid bacteria added a silage inoculant. Therefore, *L. brevis*, a heterofermentative lactobacillus, is expected to improve aerobic stability of silages. In two recent lab scale silage trials the properties of *L. brevis* to improve fermentation quality and prolong the aerobic phase were investigated in maize silages, which are traditionally especially susceptible to aerobic spoilage due to a high sugar content.

Materials and Methods Maize was ensiled in two lab scale trials. One trial was conducted with whole maize plants (MWP), the other with crushed maize grains (CMG). As inoculant, *Lactobacillus brevis* was used at a dosage of 5 x 10^4 cfu/g silage. Untreated silages served as control. The size of the sample silos was 0.5 or 2.0 kg, depending on the day they were analysed. There were 4 sampling days: 2 and 7 days after ensiling small (0.5 kg) silos were opened, 45 (± 1) and 91 days after ensiling large (2.0 kg) silos were opened. For each treatment group triplicate silos were prepared for each sampling day. The total trial time was 3 months. Analyses comprised aerobic stability testing by differential temperature measurement according to Honig (1990). Aerobic stability was evaluated as the time during which temperature in the silage samples did not increase to more than 3°C above ambient temperature. The test was carried out at an ambient temperature of 23 (±2) °C. Further analyses included determination of acidification by pH measurement via single rod measuring cell and analysis of anaerobic dry matter (DM) loss by drying (105°C, 24 h), differential weighing and calculation. Statistics were determined via SPSS 10.0 using U-tests or ANOVA plus post-hoc Tukey HSD test.

Results and Discussion It was found that aerobic stability was improved in both whole plant maize silage and crushed maize grains silage by up to 7 days in comparison to the untreated control (Figure 1). Furthermore it was found that fermentation quality of both silages was improved. The dry matter loss was reduced by ~0.5% in both silages in comparison to control (Figure 2). Acidification in both silages was significantly faster ($P<0.05$ on day 7) in the samples treated with *Lactobacillus* (Figure 3).

Conclusion The addition of *Lactobacillus brevis* successfully improved both the aerobic and anaerobic quality of maize silages. The prolonged aerobic stability grants a longer feedout phase and less mould and yeast spoilage. Quicker acidification results in anaerobically stable silage and prevents growth of anaerobic undesirable microorganisms. The reduction of dry matter loss is an additional economic advantage.

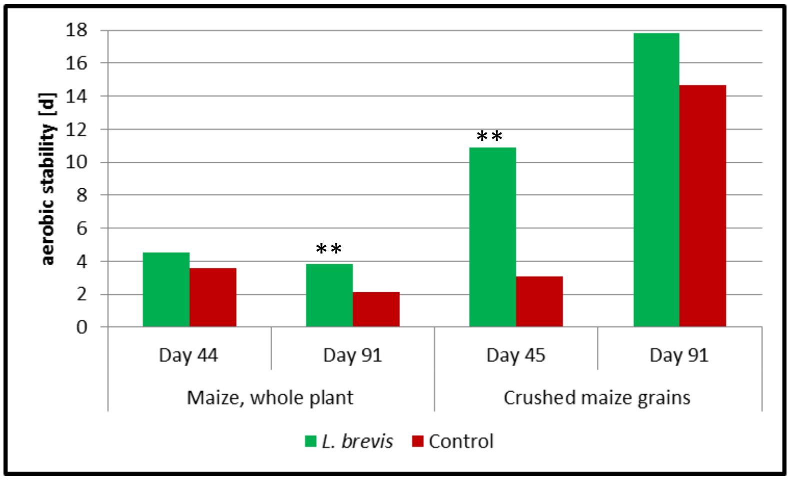

Figure 1. Aerobic stability in *L. brevis*-treated and untreated maize silages (n=3)(1)

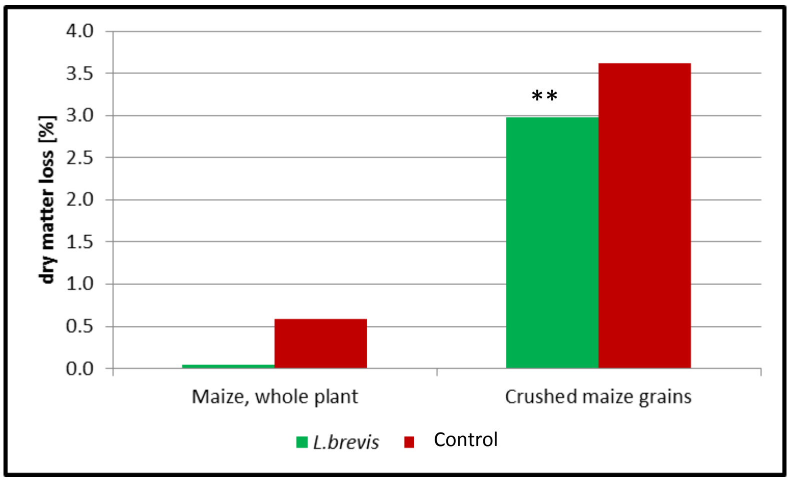

Figure 2. DM loss in *L. brevis*-treated and untreated maize silages (n=3)(1)

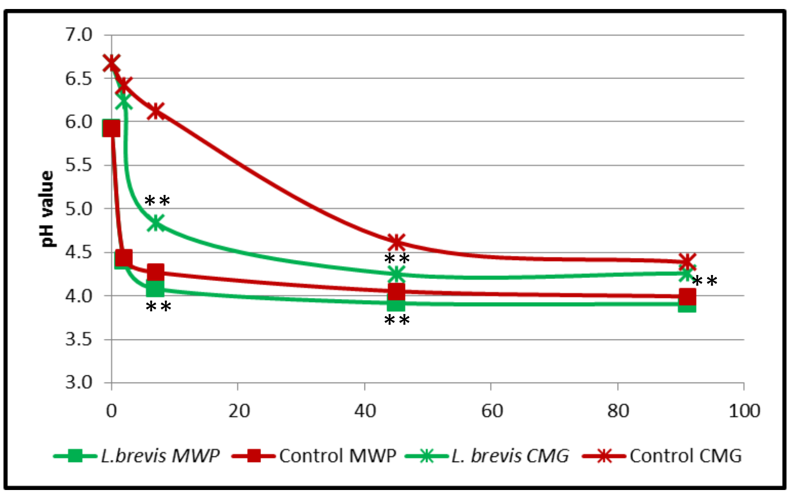

Figure 3. Acidification in *L. brevis*-treated and untreated maize silages (n=3)(1)

(1) **P<0.05