## Effects of inoculation of LAB on fermentation pattern and clostridia spores in easily ensilable grass silages

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**Introduction** Clostridia can damage the protein quality of grass silages. They cause high gas losses during the fermentation process and quality problems in dairy products like semi-hard cheeses. In comparison to the effect of chemicals such as nitrite on undesirable clostridia in grass silages the respective inhibitory mechanism of LAB requires further investigation. The objective of this experiment was to study under laboratory conditions novel isolates of lactic acid bacteria (LAB), selected for their inhibitory effect on clostridia in grass silages.

**Materials and methods** Eight grass swards from the first cut 2004 were used for fermentation trials comparing a control (C) without additive to silage treated with a commercial LAB-inoculant (LAB). The grass crops were slightly wilted and treated with a mixture of C*lostridium sporogenes* (DSM 795, DSM 633), C*lostridium tyrobutyricum* (DSM 2637) and *Clostridium butyricum* (DSM 10702) at a rate of $1.0x10^2$ spores/g FM at the time of ensiling. The trials were conducted according the guidelines of the German silage additive approval scheme (DLG 2000). The inoculant, consisting of *Lactobacillus paracasei* (DSM 16245) *Lactococcus lactis (*NCIMB 30160) *Pediococcus acidilactici* (DSM 16243), was applied as a suspension at a rate of $5.0x10^5$cfu/g of grass. The silages were stored for 14, 49 and 90 days at 25°C. Silage parameters, yeasts, moulds and clostridia spores were analysed according official methods (LUFA). Aerobic instability and corresponding DM losses were assessed by measuring the temperature rise above ambient according to Honig (1990). Fermentation losses were monitored by frequent weighing of the 1.5 l jars.

**Results** The mean sward composition on a dry matter basis at ensiling was as follows: 31% of FM, 16.4% of crude protein, 13.5% WSC and BC of 6.4 g lactic acid per 100 g DM. The mean fermentability coefficient (FC) was 48. The material was free of nitrate and contained 4.5 log MPN/g FM of clostridia spores. In Table 1 selected fermentation parameters, aerobic stability as well as numbers of LAB and clostridia spores are shown. Extending the storage period up to 90 days increased the amount of butyric acid (BA) in the untreated control. The pH decline during the ensiling process reduced the clostridia spores on average by one logarithmic unit in the untreated silages. Addition of LAB improved the fermentation profile by lowering pH, BA, $NH_3$-N and gas losses. However, aerobic instability and DM losses were increased in the treated silages, as well as the numbers of yeasts and moulds. Clostridia spores were reduced at all stages of storage period.

**Table 1** Mean silage parameters and clostridia spores of grass silages at 14, 49 and 90 days of storage

| Item | | 14 days | | 49 days | | 90 days | |
|---|---|---|---|---|---|---|---|
| Treatment | unit | C | LAB | C | LAB | C | LAB |
| DM | % | 32.9 | 33.0 | 32.0 | 32.2 | 31.9 | 32.1 |
| pH | | 4.4 | 3.9 | 4.1 | 3.8 | 4.0 | 3.8 |
| BA | % FM | 0.1 | 0.0 | 0.14 | 0.0 | 0.25 | 0.01 |
| $NH_3$-N | % total N | 8.0 | 6.0 | 10.0 | 8.0 | 10.0 | 7.0 |
| DM-losses | % DM | 7.5 | 6.5 | 8.8 | 6.8 | 8.0 | 6.7 |
| Aerobic stability | days | - | - | 3.1 | 1.9 | - | - |
| Stability losses | % DM | - | - | 9.7 | 15.2 | - | - |
| Yeasts | log cfu/g FM | - | - | 4.4 | 5.3 | 2.4 | 3.2 |
| Moulds | log cfu/g FM | - | - | 2.4 | 3.1 | 2.4 | 2.5 |
| Clostridia spores | log cfu/g FM | 3.2 | 2.4 | 3.9 | 3.0 | 3.3 | 2.9 |

**Conclusions** The results of the study showed that inoculation with LAB significantly improved the fermentation quality of easy ensilable grass silages and reduced the number of clostridia spores. However, the aerobic stability was reduced as a consequence of lower concentrations of butyric acid in the inoculated silages. Further analysis of DOM will be conducted.

**References**

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