SILOSOLVE® FC

Understanding Lactic Acid Bacteria in Silage Preservation: Homofermentative vs. Heterofermentative, Part II

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Silage preservation is a key aspect of forage management in agriculture and the use of lactic acid bacteria (LAB) plays a crucial role in this process. Among LAB, two categories are particularly important: homofermentative and heterofermentative bacteria. These two types of bacteria have distinct fermentation patterns and are used under different circumstances depending on the specific requirements of the silage.

Homofermentative Lactic Acid Bacteria
Typical homofermentative lactic acid bacteria include *L. plantarum*, *Pediococcus pentosaceus*, *Enterococcus faecium*, *Enterococcus lactis* and *Lactococcus lactis*. Homofermentative LAB mainly produce lactic acid from the fermentation of sugars. This characteristic has an important implication for preserving silage — it helps decrease the pH level rapidly.

As such, homofermentative LAB are typically employed when a rapid pH drop is needed to stabilise the silage quickly, particularly for high-moisture forages prone to spoilage by Clostridia.

Heterofermentative Lactic Acid Bacteria
Typical heterofermentative lactic acid bacteria include *L. buchneri*, *L. hilgardii*, *L. diolirovans* and *L. kefiri*. In contrast to homofermentative LAB, heterofermentative LAB produce not only lactic acid but also other byproducts like acetic acid, ethanol, 1,2-propanediol, carbon dioxide and various volatile organic compounds.

Highlights

- Heterofermentative lactic acid bacteria (LAB) produce acetic acid, which helps to enhance the resistance of silage against spoilage organisms during feed-out.
- Some university trials have found that elevated levels of acetic acid in the ration may decrease feed intake.
- The recent study showed no negative effect on the feed intake of dairy cows when the total mixed ration contained silages treated with **SiloSolve® FC**. Additionally, the energy-corrected milk yield was significantly increased.

Acetic acid prevents the growth of yeasts which can cause heating and spoiling of the silage after the clamp is opened. This means that heterofermentative LAB can help enhance the resistance of silage against spoilage organisms during feed-out.

Therefore, heterofermentative LAB are often chosen when enhancing aerobic stability is a priority.

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Impact on Feed Intake

Several studies found the positive effects of silage inoculants containing only homofermentative LAB on feed intake and animal performance. However, these university trials used fresh silage without any signs of heating or spoiling in the test. Every farmer knows that feeding warm, spoiling silage reduces the feed intake and milk performance of dairy cows and negatively impacts the animals' health.

There is no definitive evidence that heterofermentative LAB reduce feed intake. Studies where pure acetic acid was added to the diet found that an increased level of acetic acid decreased the intake of silages or total-mixed rations (TMR). However, it's crucial to consider several factors when interpreting such results. The natural production of acetic acid by heterofermentative LAB during the ensiling process may affect feed intake differently than pure acetic acid added directly to the diet. Additionally, other organic acids and compounds produced during natural fermentation could interact with acetic acid and potentially influence its impact on feed intake. Some research even suggests that the complex fermentation products may enhance the palatability of the silage for animals.

The outcomes can vary greatly depending on various factors including the specific bacterial strains used, the type of forage ensiled, and how the forage was ensiled. Indeed, silages fermented by heterofermentative LAB sometimes have a distinctive vinegar-like odour. If animals are unfamiliar with this smell, they may initially exhibit a slightly decreased feed intake when offered the new rations. However, they typically adapt over time to the presence of acetic acid and other fermentation products, potentially mitigating any initial decrease in feed intake.

The effects of *L. buchneri* on feed intake can also vary depending on the combination with other lactic acid bacteria used in an inoculant. A recent trial investigated the effect of feeding total mixed rations (TMR) containing untreated grass and maize silages or treated with SiloSolve® FC on feed intake and milk production. SiloSolve® FC contains a patented combination of *L. buchneri DSM22501* and *Lactococcus lactis DSM11037*. Cows got the tested TMR three weeks before calving and six weeks after calving. The treated TMR numerically increased feed intake and significantly improved energy-corrected milk production during the trial. (Figure 1).

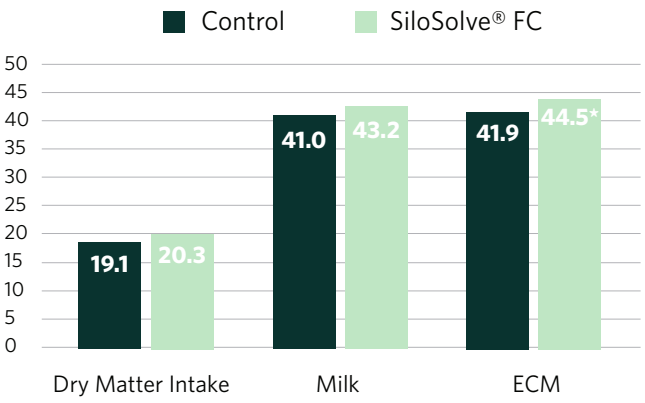

Figure 1. Effect of SiloSolve FC treated grass and maize silages as part of TMR on dry matter intake, milk yield and energy corrected milk yield (ECM), in kg/day. * Effect was significantly different (P<0.05) Reference: Nino et al., 2023: Proceedings of the 19th International Silage Conference

In conclusion, there is no definitive evidence that all silage inoculants containing heterofermentative bacteria negatively affect feed intake. In contrast, fresh stable silage prepared by a science-based research-proven inoculant such as SiloSolve® FC may improve feed intake and animal performance.