SILOSOLVE® FC

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

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Introduction
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. The swift drop in pH inhibits the growth of undesirable microorganisms, particularly Clostridia. Clostridia contamination can lead to spoilage through butyric acid production, protein breakdown, and the production of potentially toxic biogenic amines.

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

Highlights

- Lactic acid bacteria (LAB) are crucial for silage preservation, LAB being used to rapidly decrease pH, inhibiting undesirable microorganisms like Clostridia.
- Homofermentative LAB, such as *L. plantarum* and *Pediococcus pentosaceus*, primarily produce lactic acid, quickly lowering pH levels to stabilize silage and prevent spoilage, especially in high-moisture forage.
- Heterofermentative LAB, such as *L. buchneri*, 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.

Homofermentative LAB do not improve the aerobic stability of silage. A well-fermented silage can start to warm very quickly after the clamp is opened because yeasts survive at low pH and start to use lactic acid as an energy source once they get access to oxygen.

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As a result, the temperature and pH of the silage increases, creating an optimal environment for other undesirable microorganisms and moulds. Without adequate aerobic stability a significant amount of silage can be lost due to aerobic spoilage.

Seing is believing™ test

One kilogram of fresh grass, harvested at 24 % dry matter, was sealed in a vacuum bag, either untreated or treated with a product containing homofermentative lactic acid strain *L. plantarum* at a dose of 1,000,000 CFU/g or treated with the silage inoculant **SILOSOLVE® FC** containing a mixture of a homofermentative strain *L. lactis* DSM 11037 and heterofermentative strain *L. buchneri* DSM 22501 at a dose of "only" 250,000 CFU/g. After 60 days, the bags were perforated to allow free air access inside them and the silage temperature was measured every two hours. Silage temperatures after opening are presented in Figure 1.

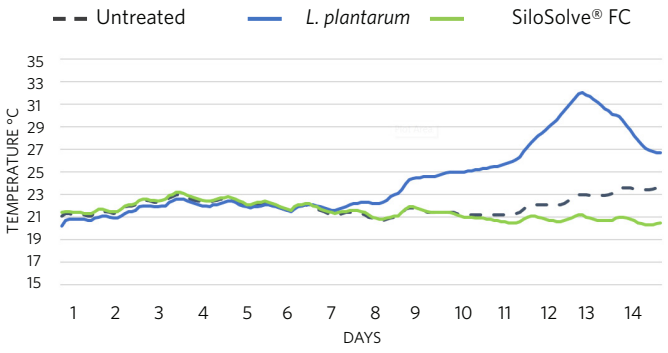

Figure 1. Temperature measurements of grass silage after opening

The **SILOSOLVE® FC** silage stayed cool for all 14 days during the test. Untreated silage started to warm after 10 days, whereas silage treated with *L. plantarum* started to heat up even earlier than untreated silage.

Picture 1 shows the visual quality of the silages after 14 days of aerobic exposure. Untreated silage showed signs of starting to spoil. *L. plantarum*-treated silage was completely spoilt, while **SILOSOLVE® FC** silage was still fresh and had a pleasant odour.

Untreated | *L. plantarum* | SiloSolve® FC

Picture 1. Pictures of grass silages after 14 days of aerobic exposure.

In conclusion, silage inoculants containing only homofermentative LAB and those containing heterofermentative LAB should be selected based on the specific needs and goals of the silage harvest and feeding. In cases, where the silage is consistently free of butyric acid but exhibits heating and spoilage after the clamp is opened, an inoculant containing heterofermentative lactic acid bacteria can effectively address this issue.

It's always a good idea to seek advice from your feed adviser and consider all factors before making a decision.