

Editorial

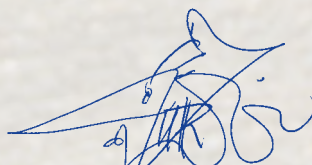
Make feeds your priority

The quality of primary feeds such as silages influences feed intake, productivity, animal health and fertility. Ensuring good quality feeds is thus the basis for profitable agricultural production. Intensifying farm production is not only in the best interest of the farmer, but also of prime importance on a global scale for feeding a growing world population.

The BIOMIN product range in silage inoculants is based on extensive research on maximising the preservation of silage energy and dry matter. BIOMIN isolated its own bacterial strains, developing them from the lab bench up to large-scale production in the Biomin Research Center based in Tulln, Austria. Many laboratory and field trials have confirmed the effectiveness of our silage inoculants under very different farm conditions, climates and crops.

Our latest innovation is the new EFSA (European Food Safety Authority)-approved heterofermentative silage strain, *Lactobacillus kefir*. In August 2013, EFSA confirmed that the silage inoculant has no adverse effects on animal health, human health or the environment. The preparation was also found to improve the aerobic stability of silage by increasing acetic acid production and reducing silage pH. This means that the novel *L. kefir* silage inoculant meets all the criteria for stringent safety and efficacy evaluations in the EU feed register. On page 5, **Science&Solutions** describes the special properties of *L. kefir* and its ability to reduce silage pH while improving aerobic stability.

The key to quality silage lies not only in a novel strain but a holistic concept of management. We hope our readers will gain from the tips on silage management and improving dry matter intake in this debut issue of **Science&Solutions** for the ruminant sector.



Jutta Zwielehner PhD
Product Manager



Planning for silage success

The year-end is a good time to evaluate the quality of the past year's silage and plan for achieving even better silage in 2014.

Most crops in the northern hemisphere have been harvested for this season. The quality of stored feed cannot be changed, yet this quality will determine milk production and profitability for the

It pays to plan! Buying your silage additives well ahead of the season often results in better prices and cost savings.



Photo: iStockphoto

coming months. It is thus important to start evaluating in order to plan for improvements in the different parameters of silage quality for 2014.

Some of the most common mistakes are inappropriate bunker silo measurements, non-airtight closing of the silo and insufficient compacting. These often result in the growth of yeast and mould. Mould growth could lead to the production of mycotoxins while yeast growth results in increased silage temperature, decreased amounts of dry matter, ethanol formation and a lower energy content.

Research also shows that feed intake is dramatically reduced when animals are fed with heated up silage.

Evaluate your silage quality

- What were the results of the silage analysis?
- What was the content of butyric acid, ammonia and ethanol in the silage?
- Did the silage or TMR heat up during the summer?
- How was feed intake and animal performance?

Hygiene

Planning for high quality silage is important and several factors should therefore be considered. Empty silos should be cleaned and any wastes removed. Feed left-overs could contaminate incoming silage with spoilage organisms. Mice and rats also like to feed on left-overs.

Silos should be regularly checked for holes in the

plastic foils. Rodent control strategies should be implemented if there are rats or mice.

Management

Do the bunker silos have the right measurements? Good bunker silos are designed so that silage can be well compacted. Walls help in achieving good compaction. The silos should be designed for a feed-out rate of 3 meters per week during the summer and 1.5 meters per week during the winter.

Ensure that high quality foils are available during harvest. Foil should be used on the walls of the silo and the top foil should fit the entire bunker silo. Important technical parameters for the choice of foil are UV-resistance, oxygen permeability and elasticity.

Self-propelled forage harvesters are becoming bigger while the capacity for compacting does not often increase to the same extent. To allow sufficient time for good compacting, a minimum 1 tonne compacting capacity is required for every tonne of dry matter harvested per hour. For a forage harvester with a capacity of 15 tonnes dry matter per hour, either a 15-tonne loader or two 7.5-tonne tractors may be used.

Silage additives

Select the right silage additive. Different bacterial strains are available to maintain the feed quality.

Homofermentative bacteria strains like *Lactobacillus plantarum* are added to improve fermentation by a rapid production of lactic acid. This gives spoilage organisms a shorter time-frame for growth, resulting in

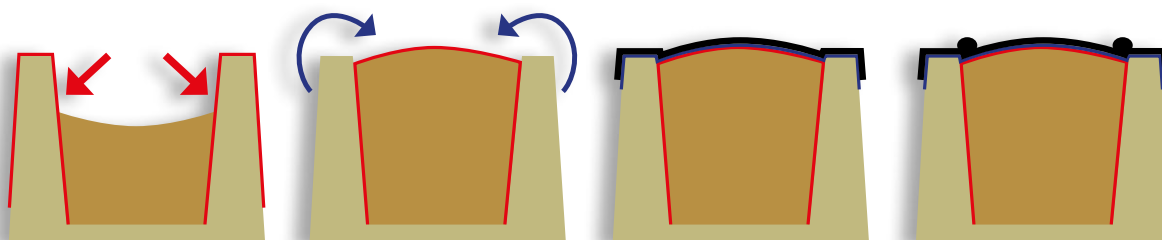
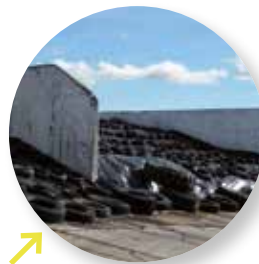


Figure 1. Cross-section of a bunker silo with correct filling shape and closing.

Tips for better silage in 2014



Ensure that silo measurements are correct and that silos are cleaned up before use.



Optimise compacting capacity to match harvesting capacity.

reduced dry matter losses and lower levels of butyric acid, ethanol, ammonia and histamine.


Heterofermentative bacteria like *Lactobacillus brevis* and *Lactobacillus kefir* produce the antimicrobial acetic acid which prevents yeast growth. Yeast growth is a problem when silage is exposed to air. Yeasts cause feed to heat up and result in ethanol production, increased pH, a reduction in the energy content and can set off the growth of other spoilage organisms.

It is recommended to choose a silage inoculant which contains both homo- and heterofermentative bacteria. Different types of silages require different inoculants. The box text on the right discusses the need for a well-balanced combination of both homo- and heterofermentative strains.

Prepare a top layer treatment

Moulds occur most frequently in the top layer of the silo. Their occurrence depends on the mould contamination level at harvesting and the amount of available air in the silage. Moulds need oxygen to grow, so the visible occurrence of moulds means that oxygen has been present in this part of the feed. Oxygen can enter the silo when compaction is insufficient or due to non-airtight closing of the silo. Furthermore, the oxygen permeability of the plastic foils can play a role.

A good way to protect the top layer of the silo from mould growth is the use of Biomin® Clean-Grain liquid. CleanGrain liquid is designed to be highly effective against yeast and mould while being at the same time safe to use as it is non-corrosive. The recommended dosage is 3-5 L/tonne for the entire silo or top layer. Alternatively, 0.5-1L/m² can be applied as surface treatment to the outer top layer with a watering can.

Silage matters and the right decisions are crucial as animals feed on the silage you have in stock. Good silage pays itself off through higher meat and milk production. 

Heterofermentative silage inoculants:

Which to choose?

Maize silages are the least problematic to ensile because they have a relatively high sugar and starch content, low protein content and therefore low buffering capacity. Furthermore, harvested maize usually contains over 300g/kg dry matter. These factors taken together explain why inoculants with a high proportion of heterofermentative silage bacteria give the best results in maize silage.

For grass and legume silages, it is important to achieve a low and stable pH as quickly as possible through lactic acid production. Homofermentative silage inoculants (e.g. *Lactobacillus plantarum*) can direct the speed and the pattern of fermentation.

Lactic acid, the main metabolite of homofermentative strains is one of very few microbial metabolites which improve feed palatability. Unfortunately, high levels of lactic acid make silages more susceptible to aerobic spoilage.

A good balance must be achieved between lactic acid and acetic acid for excellent palatability as well as aerobic stability (or shelf-life). Therefore, it is recommended to combine the use of inoculants of homo- and heterofermentative strains.

But which heterofermentative bacteria is the most suitable for different types of silage?

Making the right choice

Heterofermentative silage inoculants produce acetic acid to directly inhibit spoilage yeast and mould during fermentation and feed-out.

The disadvantage of heterofermentative silage inoculants is that acetic acid production is metabolically expensive and causes some dry matter losses.

With increasing numbers of heterofermentative silage strains on the market, the choice of the right strain becomes increasingly difficult. *Table 2* compares the differences in fermentation efficiency between the three heterofermentative silage inoculants that are currently registered in the EU.

Photo: Fotolia



Choose high quality silage additives and foils.



Evaluate the most suitable top layer treatment for your farm.



Train employees on practical silage management.

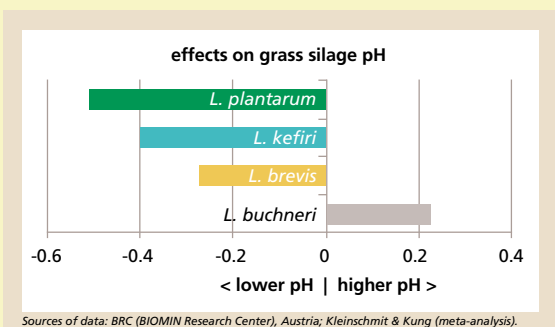
Table 2: Comparison of heterofermentative silage

<i>L. brevis</i> & <i>L. kefir</i>	<i>L. buchneri</i>
Acidifies corn and grass silages with lactic and acetic acid	Does not acidify silage, because acetic acid dominates
Extends aerobic stability. <i>L. kefir</i> inhibits yeast growth	Extends aerobic stability and inhibits yeast growth
Suitable for all silages – corn as well as grass and legume	Suitable for corn silage, less suitable for grass silage
Preserves dry matter in all silages	Causes dry matter loss

→ **Acidifying grass silage**

L. kefir and *L. brevis* are able to acidify grass silage compared to the untreated control.

Figure 2. Change in grass silage pH (single-strain laboratory silage fermentations)



→ **Dry matter preservation**

L. brevis and *L. kefir* are the only heterofermentative silage inoculants suitable for both maize and grass silage.

Table 3. Average dry matter (DM) recovery in silage inoculated with only one silage bacterium. Maize and grass silages were analysed separately under single-strain laboratory silage fermentations.

Treatment with single strain	DM recovery (%)	
	Maize silage	Grass silage
<i>L. brevis</i>	98.5	96.9
Control <i>L. brevis</i>	98.2	96.3
<i>L. kefir</i>	97.5	95.9
Control <i>L. kefir</i>	98.1	93.9
<i>L. buchneri</i>	94.1	95.1
Control <i>L. buchneri</i>	95.5	96.6

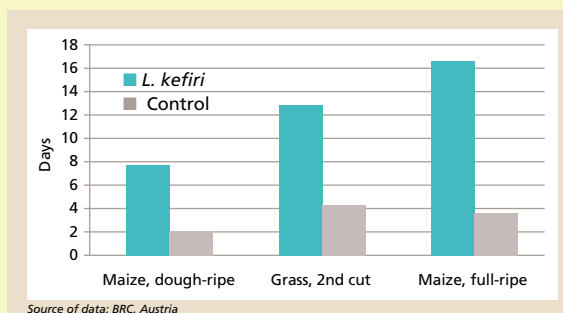
Sources of data: BRC, Austria; Kleinschmit & Kung (meta-analysis).

→ **Aerobic stability**

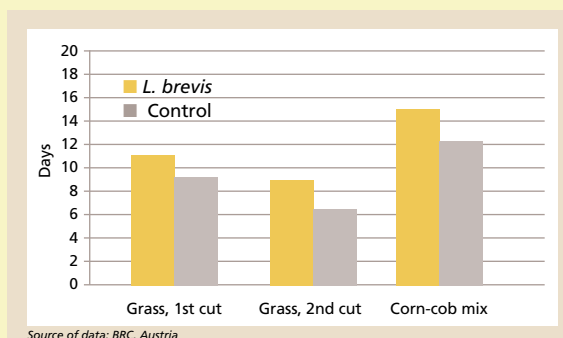
L. brevis supports fermentation and DM recovery in all silages and supports aerobic stability. Because of considerable amounts of acetic acid, *L. kefir* is a good choice for improved aerobic stability.

Figure 3. Comparison of the aerobic stability of silages treated with either *L. kefir* or *L. brevis* (single-strain laboratory silage fermentations)

Aerobic stability of *L. kefir*



Aerobic stability of *L. brevis*



→ **Palatability**

The Biomin® BioStabil strains *L. brevis*, *L. kefir* and *L. plantarum* were selected as silage inoculants owing to their excellent palatability properties. All three strains were not found to produce 1-propanole, a metabolite which greatly diminishes feed palatability.

Did you know...

Learn how to assess and maintain silage quality on the field with this BIOMIN video!



Biomin® BioStabil

Preserve the energy in your silage!

Blend of homo- and heterofermentative bacteria

- Better fermentation
- Longer aerobic stability
- Reduced dry matter and energy losses
- Higher productivity and profitability



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