



BIO-SIL[®]

IMPORTANT INFORMATION

FAQ SECTION

ONE PRODUCT - ONE APPLICATION RATE - ONE OUTCOME - HIGH QUALITY SILAGE

IMPORTANT FACTS

WHY IS **BIO-SIL®** SO USEFUL FOR THE PRODUCTION OF HIGH-QUALITY SILAGE?

Although epiphytic lactic acid bacteria are naturally occurring and are found on the standing crop, the population on plants is very variable. On most crops and in particular on first cut grass and whole crop silage there is a wide variety of other undesirable micro-organisms such as yeasts and moulds (see table 3) along with the *Lactobacillus plantarum* bacteria.

Table 3: Microorganisms on the forage and their demands to develop

Microorganism	Oxygen Demand			Activity limit for pH	Suppression by
	yes	option	no		
Lactic acid bacteria			x	3.6	
Butyric acid bacteria			x	4.2	rapid pH value decrease to pH 4 by inoculant adiction
Enterobacteria		x		4.3	
Yeasts		x		2.2	Measures against post fermentation
Bacillus species	x			4.5	Oxygen removal
Mould fungi	x			3.0	

Source: H.Jeroch, G Flachowsky, F.WeilBbach: Futtermittelkunde; Jena/Stuttgart 1993, amended

- ✔ The ability of *Lactobacillus* bacteria to rapidly produce large volumes of lactic acid varies widely and is not related to plant species or variety, maturity stage, or growing conditions. Therefore the volume of lactic acid produced from ensiled crops cannot be accurately predicted prior to ensiling. Using **BIO-SIL®** eliminates this uncertainty.
- ✔ In about 80% of all silage crops the natural lactic acid bacteria population is not sufficient to achieve a fast drop of pH to a value which will inhibit the undesirable bacteria (in less than three days). This also applies to maize silage, despite maize being easily ensiled due to a high amount of fermentable carbohydrates. **BIO-SIL® ensures the bacterial population is optimised to give rapid fermentation.**
- ✔ The application of the specially selected active lactic acid bacteria in **BIO-SIL®** is an important addition for the production of **top quality silage.**

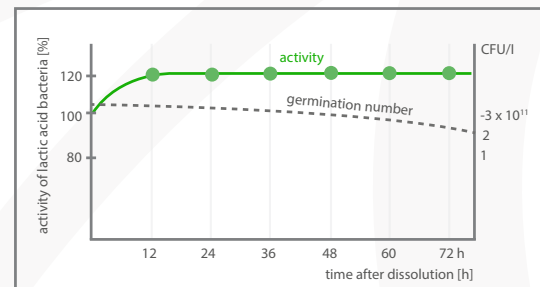
IS IT POSSIBLE TO USE LOWER APPLICATION RATE ON THE FORAGE HARVESTER?

With accurate application it is possible to increase the concentration of the **BIO-SIL®** solution and therefore reduce the application rate to about 0.4 l/tonne of fresh material. This flexibility **offers the opportunity to avoid forager refills on long work days.** Obviously it is vital that the **BIO-SIL®** concentration is adjusted accordingly.

HOW LONG WILL THE MIXED INOCULANT REMAIN ACTIVE?

In the right conditions **BIO-SIL® will remain fully effective for 72hrs after mixing.** This is another benefit of the **BIO-SIL®** inoculant, **providing flexibility if the harvest process is interrupted** by bad weather or mechanical breakdowns. Not only is the inoculant still viable, but its effectiveness is even enhanced. The DLG approval scheme

Figure 2: Activity and number of lactic acid bacteria in the inoculant as a function of time after dissolved



includes a one to two hour bacterial multiplication period and the test results and approval is based on this period. In tests where **BIO-SIL®** was allowed to multiply for 12 hours, there is a 20% increase in the bacterial activity and this is maintained for at least 72 hrs (see fig.2) This indicates that **the bacterial solution can be used for at least three days without any reduction in efficacy.** Practically this is very important, taking the pressure off the busy start of harvest period and allowing the silage to be harvested in the correct conditions. Care must be taken to ensure the temperature of the **BIO-SIL®** solution should not exceed 24°C over a long period.

HOW LONG IS THE FREEZE-DRIED PRODUCT USEABLE?

When stored in a refrigerator (4-6°C) the **storage time is at least one year and two years at minus 18°C** (typical freezer temperature)

HOW OFTEN MUST THE LIQUID DOSING DEVICE BE CLEANED?

The dosing device should be thoroughly cleaned twice a week and at the end of the season.

WILL **BIO-SIL®** CAUSE ANY CORROSION TO FARM MACHINERY?

No.

WHY IS THE INOCULATION CONCENTRATION OF **BIO-SIL®** ONLY 300,000 CFU/G?

The inoculation concentration is vital for making successful silage, and also for the efficiency and activity of the lactic acid bacteria. There are thousands of different strains of lactic acid forming bacteria all with different properties and activities. When selecting, developing and producing the *Lactobacillus* strains contained within **BIO-SIL®** only **highly efficient strains** were considered. Rapid lactic acid production across a broad range of crops was required. The final strains were chosen due to their high activity under sub-optimal conditions. Physiological properties such as activity and rate of survival in the inoculant also play a big role.

Using the specific selected strains and our production technology **BIO-SIL®** can achieve the same, or an even **better effect, than cultures with other strains** at much higher concentrations. That is why the DLG quality mark has been granted for **BIO-SIL®** at these concentrations.

IS THE NUMBER OF BACTERIAL STRAINS OR SPECIES IMPORTANT FOR THE EFFICIENCY OF THE BACTERIAL CULTURES?

No. The effect of cultures has been tested and demonstrates that a high-performance strain of *Lactobacillus plantarum* achieves a better effect than a mixture of five different lactic acid forming strains.

WE OFTEN HEAR OF ENZYMES IN LACTIC ACID BACTERIA PREPARATIONS. WHAT DOES IT MEAN?

In difficult to ensile crops with very low sugar %, there is sometimes not enough sugar for the bacteria to use to produce good levels of lactic acid. Enzymes such as amylases, cellulases and others are able to split polymolecular carbohydrates, thus making them easily available to lactic acid bacteria. Enzymes should only be used in the most extreme cases as their actions can lead to an increased production of effluent leading to greater losses and a reduction in available fibre. In UK conditions with well-made silage it is extremely unlikely that enzymes are required. Furthermore, enzyme additions make the product more expensive.

WHY IS LIQUID APPLICATION OF LACTIC ACID BACTERIA PREFERRED TO GRANULATES?

Both liquid and granulated products showed their efficacy in DLG tests, however liquid application is generally accepted as being the most desirable solution and as such is now incorporated into most forage harvesting machinery. Granular applications are not as uniformly distributed within the silage as liquids and also require longer to act. The granulated inoculants require hydration before they can begin producing the vital lactic acid. **BIO-SIL®** provided in a suspended solution can **get to work as soon as it comes into contact with the forage**.

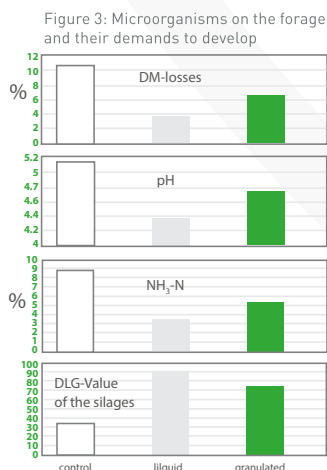


Figure 3 shows the influence of application in a liquid or granulated forms of **BIO-SIL®** on dry matter losses, pH drop and NH₃-N content. These are results from recent studies. The scoring of DLG (100 is maximum) shows the benefit of the liquid versus the dry inoculant.

Initial results of Zierenberg (table 4) demonstrate, that **BIO-SIL®** reduces the concentration of the undesired **Enterobacterias**, described as metabolism products, the Endotoxins. These biotoxins may cause diseases such as mastitis..

Table 4: Reduction of the Endotoxin concentrations by **BIO-SIL®** (%) In ryegrass- and red clover silage (Zierenberg, 2000, unpublished)

	Ryegrass	Red clover
Control	100	100
BIO-SIL®	23	7

Source: H.Jeroch, G Flachowsky, F.WeibBach: Futtermittelkunde; Jena/Stuttgart 1993, amended

WHY ARE HOMO-FERMENTATIVE PREFERRED TO HETERO-FERMENTATIVE LACTIC ACID BACTERIA?

With homofermentative bacteria contained in **BIO-SIL®** a **high feed intake can be achieved** due to the lower amounts of acetic acid produced. Cows tend to be put off by the pungent smell of acetic acid reducing daily feed intakes. Furthermore, the homofermentative bacteria show the smallest losses of dry matter.

IS THERE A POSITIVE EFFECT ON PROTEIN BY THE USE OF **BIO-SIL®**?

Yes, the **protein degradation is lower**, and therefore the protein quality of the silage is better. This is caused by the **rapid decrease of pH (less than three days) which prevents the activity of the proteases**.

CAN THE USE OF **BIO-SIL®** BE RECOMMENDED FOR ALL ENSILING SYSTEMS (AG BAG PLASTIC BAG, BUNKER SILO, CLAMPS, BALES)?

BIO-SIL® is **suitable to all good silage making techniques**. The principle of the fermentation process is independent of the ensiling system. The optimal effect of **BIO-SIL®** can only be achieved if principles of a good ensiling technology are practiced during all phases of silage making.

IS THE USE OF **BIO-SIL®** USEFUL IN ALL ENSILING MATERIALS?

In principle, yes. The bacterial strains of **BIO-SIL®** **have a very good effect in wet silages** due to their very high multiplication rate. Also, their osmotolerance is very high and they multiply very fast and have a very good effect even if they are applied to high dry matter forages.

Benefits can be expected with:

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Legumes	up to about 55 % dry matter
Grass, WCS	up to about 60 % dry matter
Maize silage	up to about 60 % dry matter

IS IT NECESSARY TO ADD POTASSIUM SORBATE TO **BIO-SIL®**?

Only in some extremely rare situations. Aerobic instability can lead to huge losses once the silage is opened to the atmosphere. Many inoculants require additional components (such as potassium sorbate) to control this in silages with dry matters over 30%. However **BIO-SIL®** shows good control of aerobic instability right up to 40% dry matter. This is of great benefit since the **same product can be used for a wide range of dry matters**, particularly if higher dry matter silage is produced through unexpected conditions or events.



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